The Engineering and Mining Journal

VOL. LXXXI. NEW YORK, JAN. 13, 1906. NO. 2.

Published Weekly at

505 PEARL STREET, NEW YORK

Subscription, payable in advance, $5.00 a year of 52 umbers, including postage in the United States, Canada, Mexico, Cuba, Porto Rico, Hawaii or the Philippines.

To Foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 32 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

Copies are on sale at the news-stands of the following hotels:—Waldorf-Astoria, New York; Brown Palace, Denver Palace Hotel, San Francisco, and the leading hotels in the principal cities.

Copyright, 1905, by
THE ENGINEERING AND MINING JOURNAL.

Entered at New York Post Office as mail matter of the second class.

The De Lamar Copper Refinery.*

BY PROFESSOR PUFAHL.

This important copper refinery at Chrome (near Cartaret), N. J., was erected in 1903. The raw material principally worked up consists of blister copper, containing on an average 99% Cu, purchased chiefly from western smelteries (Montana, Utah, Arizona, California), which contains up to 140 oz. of silver per ton and from 0.25 to 1 oz. of gold per ton, while the principal impurities are arsenic (0.25 to 1%), antimony, sulphur, selenium and tellurium. The plant is designed for a production of 3600 tons of electrolytic copper per month.

Before melting down the copper plates, an average sample for analysis is taken from each plate in a lot. Consecutive squares are marked out by means of a stencil (checker-board method) on the individual plates, the plates are bored through with a 15 mm. machine drill at the points marked, the borings are caught in a box placed beneath the plate, and are collected into one composite sample. In the laboratory these borings are then first of all ground down to a powder in a small handmill with fluted faces of chilled cast iron. The copper is determined (electrolytically); the precious metals by the combined wet and dry assay.

The crude copper is remelted in two reverberatory furnaces, each receiving a charge of 75 tons (of 2000 lb.) per 24 hours. These furnaces are lined to a depth of 12 in. on the hearth with quartz sand mixed with little clay; the hearth is 30 ft. long and 18 ft. broad; the grate is 10 x 6 ft. One ton of bituminous coal will melt seven tons of copper. The cost of melting down one ton of anode copper is $1.50.

Two reverberatory furnaces of the same dimensions are used for remelting the cathode copper produced in the works; the waste gases from these furnaces are passed through a Babcock-Wilcox boiler, the steam from which is fed into the main system; they then traverse the large dust chamber, and finally pass out by a 100 ft. stack.

The highly cupriferous by-products from these two operations are melted up with limestone and pyrites residues in a cylindrical water jacketed furnace giving a metal containing 80% Cu. This is added in suitable quantity to the charge in melting down the blister copper. The small proportion of matte resulting along with the blast furnace copper is for the present put on one side, and is to be worked up separately at some future date. The slag containing not more than 0.8% Cu is discarded. The blast furnace is 42 in. in diameter at the tuyeres; its height is 13 ft. The blast is admitted to the furnace by eight tuyeres at a pressure of 11 oz.

In casting the anode plates direct from the furnaces, Walker casting machines with 22 molds are used. The dimensions of the anode plates are: breadth, 90 cm. (35½ in.); height, 70 cm. (27½ in.); thickness 4 to 5 cm. (1½ to 2 in.). Their weight varies between 350 and 400 lb. From the casting machine the plates are transferred direct to iron cases in which they are hung up in sets of 15, and are taken to the electrolytic department by an electric travelling crane; here the plates are lifted out all together and placed in the cells.

About one-half of the electrolytic plant, which works on the usual (multiple system) was in operation at the time of the author's visit. The current for the entire plant is supplied by two steam-driven dynamos of 1000 and 1200 h.p., giving 5500 amperes at 115 volts and 6500 amperes at 130 volts respectively.

There are 816 cells, forming two systems of 12 compartments with 34 baths each, 480 cells in each system. The lead-lined tanks are made of strong pitch pine board and are 3 ft: 6 in. broad, 10 ft. long, and 3 ft. deep. Each bath contains 15 anodes, and 16 cathodes, the latter as terminal plates. The cells are arranged in steps in two rows, with a difference in level from tank to tank of 12 in.

The current is conveyed by copper leads measuring 12 x 4 cm. (4¾ x 1½ in.). The electrodes are suspended from the leads and receive the current from them by triangular copper rails resting upon the leads. The current density is 15 to 17 amperes per sq. ft. The difference of potential of the bath is 0.3 volt.

The cathode sheets (96 x 72 cm. = 38 x 28 in.) are not nicked. Each sheet is suspended by two copper wires of 1 cm. thickness, and is immersed in the bath to a depth of 26 in.

The finished cathodes weigh 70 to 75 kg. (155 to 165 lb.). The upper edge of each is cut off, and is melted up with the anode copper.

The cell bath is kept at 52 to 57° C., and contains 40 gm. of Cu and 140 cc. of sulphuric acid per liter. The liquid is fed to the cells from a tank placed at a higher level. It passes through a 6-in. pipe laid along the bottom of the series of cells to an uptake pipe, the overflow from which runs down a hard rubber pipe carrying a funnel and extending down to the bottom of the liquid. The electrolyte flows into the next lower tank also through an overflow pipe; from this tank it passes to the main waste-pipe through an exit pipe placed 20 cm. (8 in.) below the edge of the front wall. Every two cells therefore receive their supply of fresh electrolyte in common, at the rate of 20 liters per cell per minute.

The main waste-pipes of all compartments conduct the liquid to a reservoir through a main pipe in the cellar. From this reservoir it is pumped to a tank at a higher level, where it is freed from scraps of wood, etc., by filtration, and is finally forced into the circulation vats which are placed still higher.

In 24 hours about 350 lb. of copper are deposited on 16 cathodes in each cell. The weight of the residual anode is about 12% of the copper originally put into the cell.

The resistance of the individual cells is measured by means of a portable voltmeter, with the manipulation of which one workman is continuously employed.

When the cathodes have acquired the desired thickness, the entire set is lifted out at once, and is rinsed with a jet of water.

Only a small proportion of the electrolytic copper is sold in the form of cathodes. For melting down the cathodes, the two reverberatory furnaces mentioned above are used, from which, by the aid of a Walker casting machine, are cast direct either wire bars 135 cm. (52 in.) long and 10 cm. (4 in.) thick; or small notched ingots, used in preparing copper alloys; or cakes, from which copper sheet is made. Particularly instructive is the method of collecting and working up the anode mud. The anodes are carefully brushed off in the bath, the whole batch is lifted out at one time, and is transferred to the next higher tank. After the bath has settled clear, the liquid is siphoned off down to 6 in. from the bottom, and the whole of the mud lying on the bottom of the tank is then swilled through a trap in the bottom to a reservoir in the cellar. The mud is sifted to separate remnants of copper;

*Translated from *Zeit-f. Berg-Hutten, und Salinenwesen im Preuss. Staate*, 1905, LIII, 400.

it is then washed, and by blowing in steam is forced to the refinery near by, where it is boiled with 66° B. sulphuric acid, with addition of a little saltpeter, and is washed and collected in a filter-press. After drying it contains about 40% Ag, varying quantities of gold, much lead sulphate, and also nickel oxide and compounds of bismuth, arsenic and antimony. The mud cake is then melted down in a reverberatory furnace for 95% silver in charges of 4500 lb. per 36 hours. The furnace (a kind of English cupel-furnace) is fired with petroleum residue. It is lined with magnesia bricks and has a movable hearth. The metal is cast in molds with conical plugs into thick perforated plates for the parting operation with sulphuric acid.

Owing to the presence of arsenic, antimony, selenium and tellurium in the mud, much silver is volatilized in the melting operation. The gases sucked off by a fan are therefore, after cooling them down, filtered through flannel sacks before their entry into the stack.

The production of precious metals is said to be, when the plant is in full operation, about 10,000 oz. of silver and 400 oz. of gold per day.

From the electrolyte liquor drawn at regular intervals from the process, copper sulphate is prepared (adding shot copper) and from the mother liquor of this process crude nickel sulphate is prepared, both this and the blue vitriol being placed on the market.

A Simple Oil-Burning Equipment.

BY COURTENAY DE KALB.*

In the burning of crude petroleum for boiler-firing, the delivery of the oil to the burners *under constant pressure* is of the utmost importance. To attain this end, the oil must be sufficiently fluid to flow readily; provision must be made to regulate the pressure; and the pump must be absolutely reliable.

Many special appliances have been designed to meet these conditions, but most of them are costly and not easily repaired without considerable loss of time.

It is common practice to employ small pumps, which, though they may possess a capacity largely in excess of the requirements, are disadvantageous from the fact that they are liable to lose their priming when the oil is viscous at low temperature. To avoid this difficulty, the oil in the suction pipe should move at a low velocity; this necessitates a large capacity, and this in turn demands a pump of adequate size. Even for a 100-h.p. boiler, the diameter of pump-suction should be at least 2 in., and the discharge pipe 1½ in. Since a uniform pressure is easier to maintain with a slowly moving oil-stream, this apparently excessive size becomes a positive advantage.

A stand-pipe, constituting an upward extension from a reservoir between the pump and the burners, is provided with a weighted valve which will open when the pressure exceeds the determined limit. For good work, the pressure should be about 30 lb. per sq. in., and not more than 40 lb. The reservoir and stand-pipe can be made (as shown in

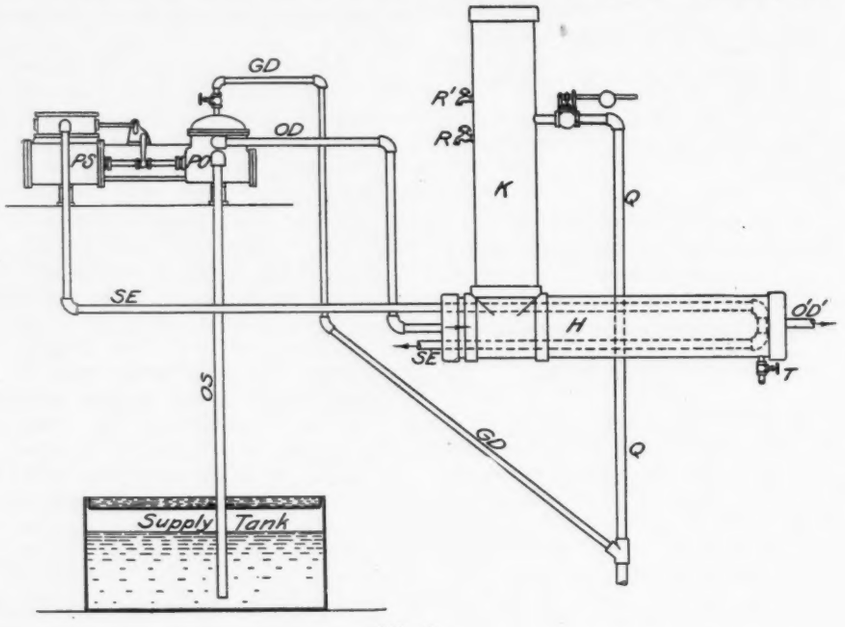


FIG. 1.

Fig. 1) of common 6-in. pipe and fittings. The exhaust-steam from the pump passes through a 1½-in. coil in the reservoir, thus pre-heating the oil to some extent before it passes on to the burners.

The equipment, shown in the illustrations, is that installed at the Exposed Treasure mill, Mojave, Calif. Referring to Fig. 1, PO is the oil end of the pump; PS the steam end; SE the steam exhaust; OS the oil suction; GD a pipe, with a valve, tapped into the valve-cap of the oil-end of the pump, to blow off gas that may accumulate; H is the reservoir into which the oil is delivered from the pump, through the pipe OD; O'D' is the oil delivery from the reservoir to the burners; K is the stand-pipe; R and R' are pet cocks; W is the weighted valve; and Q the overflow-pipe, which, joined by the pipe GD, leads back to the supply tank. T is a clean-out valve in the bottom of the reservoir. Thus the entire arrangement is a simple aggregation of pipe fitting which any mechanic can execute.

The oil, pre-heated in the reservoir, passes through a 1-in. pipe to the burners; on the way, it passes through a trap (Fig. 2), consisting of an expansion, to a 3-in. pipe, with a tee and a plugged 3-in. pipe, to catch any foreign matter that may pass the reservoir. A steam coil in the supply tank, connected to a 30-lb. pressure steam-line, admits of warming the oil before going to the pump, thus permitting most of the sand (which occasionally comes in the low-gravity oils) to settle.

At this plant, 19 bbl. of 14° B. oil (from the Bakersfield district) was the average daily consumption, when developing 125 h. p., with an ordinary return-tubular boiler. The burner used consisted of an oil tube ⅜-in. diam., placed concentrically inside a 1-in. steam pipe; this terminating, a few inches beyond the end of the oil tube, in a flattened lip with a well-formed slit on an arc of a circle. This arc was so disposed as to be bisected by the (prolonged) longitudinal axis of the oil tube. The distance from the end of the oil tube to the slit was made adjustable, to afford control of the atomizing of the oil; this could be made as perfect as in any atomizing device.

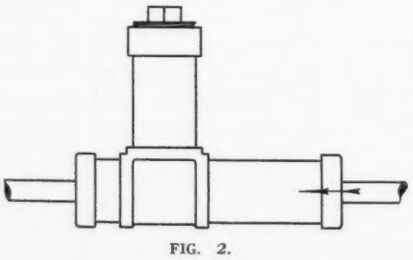


FIG. 2.

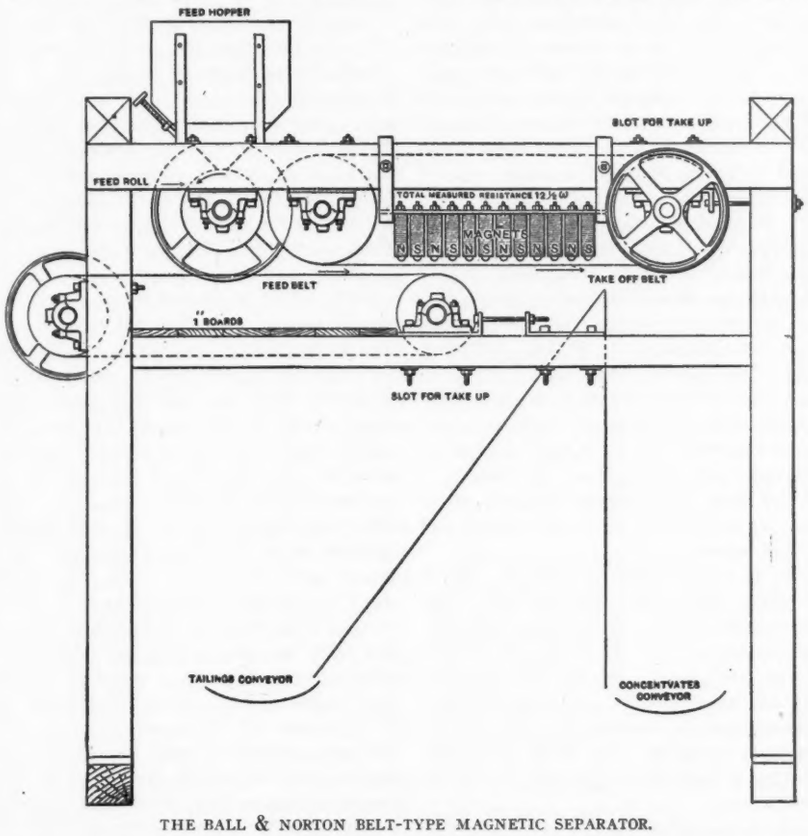
Smokeless fire was maintained with the greatest ease, even when the boiler pressure on occasions was maintained as low as 30 lb. for several hours.

Oil is generally used in cutting brass on automatic machines, and nearly all brass chips are more or less greasy. Some are soaking with oil, while others are nearly free from it. The oil does not injure the chips in any way and its only detriment is in the detraction from the weight of the chips.

*Consulting engineer, Exposed Treasure Mining Co., Mojave, Cal.

The Ball & Norton Magnetic Separator.

There has been developed at the plant of Witherbee, Sherman & Co., Mineville, N. Y., a magnetic separator which is described in *The Iron Age,* of Nov. 23, 1905, from which we take the illustration. This machine is used in the separation of strongly magnetic substances—namely, magnetite from apatite and silicious gangue. The magnet is a series of poles, alternately north and south. The action of a particle in such a field is to turn the magnetic material end over end with a jigging action. With the present form of machine the analogy to a jig turned upside down is perfect, and the machine might be called a magnetic jig. This constant agitation of the magnetized mass of ore allows the entrained particles of gangue to fall from the magnetic ore, with a thorough cleaning of the ore concentrates.



THE BALL & NORTON BELT-TYPE MAGNETIC SEPARATOR.

The ore is delivered to the feed hopper in such manner as to keep the hopper full, so that a constant feed may be delivered to the feed belt by the feed roll, which makes from 15 to 20 r. p. m., the depth of feed being regulated by a sliding gate in the side of the feed hopper next to the feed roll. The stream of ore delivered by the feed roll is uniformly distributed over the feed belt. This belt carries the ore into the influence of the first magnet of the series, and here it begins to rise, striking the take-off belt between the first and second magnets, and is held in suspension by the magnets as it travels across their face on the under side of the take-off belt. At the time of rising from the feed belt part of the gangue remains on the feed belt and is thrown into the tailings directly, but part is entrained in the magnetic mass of ore and weeps out as the jigging action occurs in passing into and out of the influence of the magnetic field. The gangue thus freed drops into the tailings compartment to mingle with that from the feed belt. The magnetic ore mass is delivered by the sustaining action of the field and the forward motion of the take-off belt into the receptacle for the concentrates. Conveyor belts may be run directly under the machine to receive the tailings and concentrates.

The machines at present in use are provided with 12 magnets, whose strength is uniform, the current flowing being controlled by a rheostat. By dividing the magnet into two or more sections, each provided with a rheostat, any degree of concentration can be had, as, for example, the well-known three-part separation of tailings, middlings and concentrates.

The feed and take-off belts are rubber, with three and two ply canvas, riveted together with coper rivets on a 6-in. lap. Endless belts have been tried, but for mill use the riveted lap has been found to answer the purpose.

The adjustments on the machines are easily made, take-ups being provided to care for the stretch in the feed and take-off belts, and may be operated with the machine running. By placing wooden shims under the bearings of the pulley of the feed belt directly under the magnets the feed is moved into an increasing magnetic field. The rheostat permits a variation in the flux in proportion to the current flowing in the circuit. The take-off belt is run at a greater speed than the feed belt, so that the magnetic mass of ore is spread out more thinly per unit of surface. The speeds of belt travel must be determined experimentally for each ore. Those whose permeability is small and those where the sizes treated are large require a slower speed than those of great permeability and small size.

At Mineville this machine has treated ore particles of ½ in. and under with satisfactory results. The average hourly capacity is from 20 to 25 tons up to and including material which will pass ¼-in. sieve. These results have been maintained for two years and under favorable conditions of dry ore could readily be kept up to 30 tons per hour. On one test when the ore was run through the mill at the rate of 144 tons per hour the machines took care of the material with no decrease in the quality of the product, this being an output of 36 tons per hour, four machines being used.

Each part of the separator is accessible and can be inspected at all times. The magnets can be renewed and new belts put on in not to exceed one-half hour. The magnets being open give free circulation of air and consequently lower temperatures of operation.

The first use of these separators was in the treatment of a high phosphorus magnetic ore, in which it is necessary to keep the phosphorus in the finished product at about 0.6%, the phosphorus in the crude ore ranging from 1.35 to 2.25%. This variation is occurring constantly throughout the day. The iron likewise is kept practically uniform in the concentrates at from 66 to 67%. These analyses are the daily averages over the period of two years of operation of this machine.

The brass rod from which "screw-rod chips" are produced is made by first casting a round "bolt" in an iron mold. The diameter of this "bolt" is of any size which can be conveniently handled. The "bolt" is rolled through rod rolls until nearly to size, when it is worked down on draw benches in order to give it a finish. The "bolt" cannot be used hot, but must be worked cold. The mixture will not stand working hot. As now made, the rolling is performed by a three-high train ingrooved rolls similar to a hot rolling train. The speed, however, is much less.

Some excitement was recently caused in Furness, England, by the subsidence of a considerable area of land at a farm at Bonsfield, near Barrow. A large hole, some 20 ft. across and 300 ft. deep, was discovered to have been caused by the subsidence of old iron mines.

Cyanidation During 1905.

BY CHARLES H. FULTON.*

The year 1905 marks distinct progress in cyanidation in almost every one of its many phases and applications. The chief improvements, however, are to be found in the treatment of slime by filter-pressing; in the greatly extended application of the process to ores whose value consists chiefly in silver; and in the successful treatment of cupriferous gold and silver ores.

Silver Ores.—The chief development of this branch of cyanidation has taken place in Mexico; although some plants are in operation in the United States, the most prominent one being the Butters plant on the Comstock Lode in Nevada. The process is employed in Mexico on such ores as were formerly treated by pan-amalgamation and by the patio processes, and also in the lower grades of this same general type of ores which formerly could not be treated economically. The silver in these ores exists chiefly in the form of argentite, stephanite, a little tetrahedrite, and some native silver, with small amounts of chloride and bromide. In general, these ores are more complex than most gold ores, in that they frequently contain minerals yielding appreciable quantities of antimony, arsenic, bismuth, etc., which make their treatment more difficult.

T. H. Oxnam (this JOURNAL, Aug. 19, 1905, page 297; Aug. 26, 1905, page 339) describes the cyanidation of silver ores at the Palmarejo mine, Chihuahua, Mexico. The ores are highly silicious, and contain silver in the form of argentite, accompanied by some stephanite and a small amount of native silver. Pyrite, manganese oxide, and calcite occur, as well as small quantities of antimony, arsenic and bismuth.

The ore is crushed by stamps, and the pulp is concentrated on Wilfley tables, after which it is classified into sand and slime in a somewhat crude way, and then cyanided. The sand contains 16 oz. silver and $2.85 gold, Mexican. The slime contains 19.25 oz. silver, and $4.35 gold, Mexican. The extraction from the sand is 96% of the gold, and 54% of the silver. The extraction from the slime (which is treated by agitation and decantation) is 51% on the silver, and somewhat less for the gold than from the sand. The strength of the solutions used on the sand is 0.75 and 0.25% respectively, sodium cyanide. Somewhat weaker solutions are used on the slime. The sand is leached for 10 days; the consumption of cyanide is 2.95 lb. per ton treated. The consumption of zinc is 0.96 lb. per ton. The consumption in the treatment of slime is 3.56 lb. NaCN, equivalent to 4.42 KCN. The cost of cyaniding sand is $1.52; of slime, $2.66 U. S. per ton.

*President, South Dakota School of Mines, Rapid City, S. D.

G. N. Miller (this JOURNAL Aug. 26, 1905, page 344) describes briefly the operation of a cyanide mill in western Chihuahua. The ores contain two-thirds of their value in silver, and one-third in gold. After crushing by stamps and concentrating on Wilfley tables, the pulp is classified into sand and slime; the sand is treated by percolation; the slime by filter-pressing. A total extraction of 84% is obtained from the material cyanided, about equally good extraction being obtained for the gold and silver.

Alfred Chiddey (this JOURNAL, June 1, 1905, page 1053) describes the cyanidation of a silver ore at El Salvador, Mexico. The ore is crushed by arrastras, the pulp passed over amalgamated plates, and then separated into sand and slime. The sand contains 13 to 15 oz. of silver and $3 to $5 in gold. The strong and weak solutions have strengths of 0.4 and 0.2% NaCN, respectively; 85 to 90% of the silver is extracted, and 90 to 92% of the gold. The consumption is about 2 lb. of NaCN per ton of material treated.

J. W. Malcolmson (this JOURNAL, Sept. 23, 1905, page 529) describes briefly the cyanidation of silver-gold ores in the Guanajuato district, Mexico; more particularly at the Sirena mill. The pulp, after concentration on Wilfley and other tables, is separated into sand and slime. A total extraction of 87% is made by concentration and cyanidation, 75% being extracted by cyanidation. Large volumes of solutions are employed in the treatment. In the Guanajuata district the gold varies from 15 to 70% of the combined gold and silver values.

H. G. Elwes (this JOURNAL, March 16, 1905, page 515; July 22, 1905, page 109) discusses the application of cyanidation to the lower-grade silver ores of Zacatecas and other districts of Mexico; and the treatment of rich argentiferous concentrates by cyanidation after chloridizing roasting at a low heat (dull red) and for a short period of time (15 to 30 minutes).

The main points, in the cyanidation of silver ores, on which most metallurgists of experience agree, are:

First.—That a comparatively long time of treatment is essential, ranging usually from 10 to 25 days. This seems reasonable owing to the fact that silver compounds are more difficultly soluble in cyanide than gold.

Second.—That a thorough oxygenation is necessary. This is obtained in most instances by a double treatment; by the withdrawal of the solutions from the vats, and by the re-aëration of solutions, etc. Granting that the reaction involved in the solution of silver by alkaline cyanides is similar to that for gold, and that the oxygen dissolved in the solution is that which is available, it would seem clear that (owing to the much larger bulk of metal to be dissolved, and the more complex nature of the ore as regards base metals present) this oxygenation is essential. In this connection, it is possible that such reagents as barium di-oxide, sodium peroxide, etc. and bromo-cyanogen, will find a much larger field than was ever probable for them in the cyanidation of gold ores.

Third.—That somewhat stronger solutions than are used in the cyanidation of gold ores must be employed. The solutions, weak and strong, range from 5 to 16 lb. NaCN, per ton of solution (which, to be expressed in terms of ordinary cyanide, must be increased by at least 25%). Generally speaking, in the cyanidation of gold ores, 5 to 6 lb. of KCN is considered a comparatively strong solution, and solutions of 1.5 to 2 lb. per ton are quite ordinary.

Fourth.—The consumption of cyanide (as might be expected in the cyanidation of silver ores) is much higher than in the treatment of gold ores. It varies, in the cases recorded, from somewhat under 2 lb. to 3.56 lb. of NaCN, which must be increased by 25% to express it in KCN. While no general figures for consumption of cyanide for gold ores are available yet, from 0.4 to 0.8 lb. KCN per ton of ore is frequent, and 1.5 lb. is considered high.

Fifth.—The precipitation of silver by zinc-thread or dust, presents no difficulty and is practically complete. As the bulk of metal to be precipitated in the treatment of silver ores is many times more than that to be precipitated in the treatment of gold ores, it might be expected that the consumption of zinc would be increased. This, however, is not so. The zinc consumption per ton of sand treated (mentioned by Mr. Oxnam), is 0.96 lb. per ton of sand treated or 1.75 oz. per oz. of silver precipitated. At Carbonate, S. D., a small tailing plant treating silver ores, a few years ago gave a zinc consumption of 0.86 oz. zinc for every ounce of silver precipitated. The zinc consumption in the treatment of silver ores is practically the same as that in gold ores (when the figures are expressed per ton of ore treated), ranging from about 0.55 to 1.5 lb. according to the nature of the ore and the amount of solution to be precipitated; but, when stated in figures expressing the consumption per oz. of metal precipitated, gold requires from 9 to 17 times as much zinc as silver. The facts as stated are probably explained by the greater concentration of the silver solutions; or, in other words, that the zinc consumption is practically a constant per ton of solution to be precipitated (irrespective of the metal contents of the solution), within such limits as are common in cyanide practice.

Treatment of Slime.—Without question, the greatest improvement in cyanidation within recent years, and one which holds out great promise, is the invention and perfection, by C. W. Merrill, of a filter-press which can be rapidly and automatically discharged without opening the press. The press is discharged by sluicing. The press in general is of the "flush-plate and

distance-frame" pattern, except that the units are much larger than in ordinary slime presses, having an area of 25 sq. ft., more or less. The chambers of the press are filled from a continuous channel, running along at the median line at the top of the frames and communicating with each filter compartment. Solutions are admitted from a channel in either of the upper corners of the frames. At the middle of the bottom of each frame, and passing through the filter-plates, is a continuous channel within which, with ample room to spare, is a supply pipe for water under pressure. The pipe is provided with nozzles projecting into each compartment. The pipe can be revolved through practically 180°, so as to play a stream of water upon all portions of the slime-cake in the chamber to be discharged, washing it down into the annular opening formed by the continuous channel through the plates and frames, and the water supply pipe. When the press is being filled and leached, the discharge channel is sealed at both ends. A modified form of the press has the water pipe and nozzles in one of the lower corners; the continuous discharge channel in the other lower corner; and each frame is provided with openings on each side, closed by doors to permit access to each filter-frame. The usual channels for withdrawing filtered solutions are provided. The press is covered by patents (798,200, etc.). It has great capacity and does away with the greater part of the cost of labor of discharging, one of the chief items in the cost of filter-pressing. Presses of this type have been in operation, experimentally, in the cyanide plant of the Homestake Mining Co. at Lead, for nearly a year, on extremely low-grade slime, having a value of from 0.80 to $1.20 per ton. That they have been commercially successful is assured by the fact that the Homestake Company is at present constructing (on McGovern hill, near Deadwood), a filter-press plant to contain about 25 presses at a cost of close to $300,000. About 4,000 tons of ore is crushed daily by 1,000 stamps. After amalgamation this pulp is separated into approximately 2,500 tons of sand (treated at the Lead and Gayville sand plants), and 1,500 tons of slime (at present wasted, but soon to be conveyed by iron-pipe lines to the slime plant on McGovern hill).

The *Moore process* is finding increased application (*Trans.* A. I. M. E., Vol. 35, "Crushing in cyanide solution in the Black Hills"), and is being gradually perfected. It has recently been installed by the Standard Consolidated Mining Co. at Bodie, Cal., and has been in operation during the year at the Lundburg, Dorr, and Wilson plant at Terry, S. D., with success. It is also being installed by the Puritan Co. near Deadwood, S. D., and by the Ernestine Mining Co., at Mogollon, New Mex. The Liberty Bell Mining Co. (which has recently installed tube-mills) treats its entire product by the Moore process. At Bodie the process also treats the tube-mill product, making an extraction of 85 per cent.

The *Mumford slime-process* has been experimented with at the Robinson Deep Mine in the Transvaal. It is an electro-cyanide process; the slime (after agitation with very dilute cyanide solution in a vat) is transferred to a revolving cylinder lined with an amalgamated copper plate which acts as the cathode, while the anodes are carbon rods in the heads of the cylinder. It is difficult to see the advantages of processes of this general type (such as the Pelatan-Clerici, Riecken, and Hendryx), which precipitate from the pulp direct. Conceding that the precipitation is good (which, however, is distinctly not the case), the loss of soluble cyanide, even though decidedly low-tenor solutions are used, will always be urged as an objection to these processes.

The *Ogle continuous filter* (this JOURNAL, Feb. 23, 1905) is a light-iron annular frame-work on which are 16 hollow filter-trays, suspended on trunnions. The frame-work revolves horizontally, the trays becoming charged with approximately ½-in. cakes; at a certain point, suction is then applied automatically to the tray; and, after traveling practically a complete revolution, the tray is tipped by an automatic tripper to discharge it, the tray immediately being refilled. Provision can also be made to wash the filter cake with solution and water during part of its travel.

Slime.—There has been considerable discussion during the year as to a proper definition of "slime." A. W. Warwick ("Western Chemist and Met.," Vol. 1, No. 2, p. 51) defines slime "As that portion of the crushed ore, which, owing to its containing combined water, possesses the property of forming colloid hydrates when mixed with water." What is known as slime in most mills, will contain these colloid hydrates, mixed with a considerable percentage of fine gritty quartz or of similar material. This addition is in many cases essential in order to permit the slime being treated at all, by filter-pressing for instance. True slime, in some cases, would make a perfectly impervious mass.

Cyanidation of Cupriferous Ores.—Considerable attention is being paid to the cyanidation of gold and silver ores that contain copper up to about 1.5% as a maximum. Amounts of copper anywhere approximating this percentage, prohibit ordinary cyanidation under most circumstances. Jarman and Brereton (*Proc.* Institution Min. & Met., Feb. 16; March 16, 1905) experimented with the ammonia cyanidation of copper ores, employing KCN and ammonia (practically the Hunt process), and with KCN and ammonium chloride. It is found, for the Hunt process, that the relative amounts of KCN and ammonia must be carefully adjusted in order to get good results. When the proportion is such that a minimum of copper is dissolved, it is found that the maximum of gold goes into solution. H. L. Sulman considers that the solvent for the gold in this case is a cupra-ammonium cyanide, having no cyanogen combined with the alkali metal; and that the solvent action is mainly due to the nascent cyanogen derived from the cupric cyanide of the cupra-ammonium compound.

An interesting (and, so far as the writer knows, the only example of the cyanidation of a cupriferous gold ore) is that of the Bagdad Chase Gold Mining Co. at Camp Rochester, in the Mojave desert, Cal. The ore is an altered eruptive rock, silicified, and containing iron oxide, malachite, and chrysocolla, with a gold value of $20 and upward. Slacked lime is added to the ore in the tanks for neutralization, and also 1 lb. of ammonium chloride for every ton of ore. The ore is then leached with a strong solution of KCN, dissolving copper, silver and gold. The solution is precipitated by zinc-thread, the high tenor of the solution in KCN preventing to a large extent the precipitation of copper in the zinc boxes. After leaving the zinc boxes, the solution is led to a tank, where the copper is precipitated by zinc dust, agitation for several hours being necessary to complete the precipitation. The amount of zinc-dust required is from 1 to 1.5 times the amount of copper present in the solution.

Sodium and Potassium Cyanide.—Whether sodium or potassium cyanide is to be employed, is still actively discussed. When the practically pure sodium cyanide was put on the market, its high value in cyanogen, its great purity, and its supposed greater solvent power, were expected within a short time to replace the KCN or the mixed salts. In the United States, however, a reaction has come in favor of the KCN, or the mixed cyanides. A number of plants in the Black Hills and in Nevada have replaced the NaCN, by the KCN and the mixed salts, on the ground that the NaCN is not quite as efficient as a solvent. Many plants, however, in this country prefer the NaCN; notably the Kendall, Mont., plants. In many Mexican plants, NaCN is in high favor, especially in those treating silver ores, which claim a higher solvent power and an appreciable saving in cost of transportation. NaCN deliquesces considerably; and, in moist climates, boxes once opened must be used rapidly.

Crushing.—Finer crushing in many districts is noticeable, and the tube-mill is finding favor in this country. The Liberty Bell mine, at Telluride, has installed tube-mills; the Standard Consolidated Mining Co., in California, has also installed one. The United States Reduction & Refining Co., at Colorado City, is putting in an experimental tube-mill plant for Cripple Creek ore. Huntington mills are installed in two plants to regrind coarse material from stamps. Crushing in cyanide solution is finding increased application in this

country wherever the nature of the ore permits it. The Standard Consolidated, at Bodie, uses this method, crushing in weak cyanide solution and amalgamating over plates. The new mill of the Tonopah Mining Co., now being constructed at Goldfield Junction, Nev., will also crush the ore by stamps in cyanide solution. Many other mills are using this method.

General Review by States.—While the number of new mills erected during the year is somewhat less than within the past few years, the amount of ore subjected to cyanidation has increased.

In *California* the Standard Consolidated has been in steady operation; in the desert region in Kern county, the Queen Esther, Echo and Karma have treated considerable ore. Two of these mills amalgamate over plates, and cyanide the sand and slime, one of them crushing in cyanide solution. The decantation process is used for slime treatment. Most of the other well known mills in California have been in operation during the year. In Sierra county, the Sierra Buttes mine has installed a cyanide plant.

In *Colorado,* the Camp Bird, Smuggler-Union and Liberty Bell mines have been in commission; in Gunnison county, the Taylor Park mine has constructed a 200-ton concentrating and cyanidation plant. It is stated that the Independence Co. has acquired the Dorcas cyanide plant for the treatment of its lower-grade ores. Several small plants are in operation in Boulder county. There are now in the Cripple Creek district six cyanide plants, having a total actual capacity of about 700 tons per day. All of the mills are not in operation, nor do they operate to their full capacity. In September, about 16,000 tons of low-grade ore were treated. The general practice is to crush coarse through a final screen of from 0.2 to 0.375-in. opening, and leach with solutions ranging from 1.5 to 5 lb. per ton. The time of treatment is approximately three days; the cost, from $1 to $1.50 per ton.

In *Dakota,* the Homestake treats very low-grade material, but its commercial success has not as yet been demonstrated. The range of ore values for the other mills is from $3.50 to $6 per ton.

The milling practice at the Camp Bird, as carried out at present (S. L. Goodale, this JOURNAL, May 4, 1905, page 850), consists of crushing with stamps; amalgamating over plates; concentrating on vanners; classifying the vanner tailing by spitzkasten; regrinding the coarse sand in Huntington mills; and passing the middling and fine, with the product of the mills, over a second set of vanners. The tailing from the vanners goes to five-compartment spitzkasten, eliminating most of the slime which for the present is stored. The sand is fed to the leaching tanks, by Butters-and-Mein distributors. Double treatment of the sand is practiced and the time of treatment is practically 20 days; 3 tons plus, of solution is applied per ton of sand, the solutions ranging from 2 to 5 lb. of KCN per ton. The extraction of gold in cyanidation is 78%.

In *Nevada,* a number of new mills have been erected, and are under construction, notably that of the Tonopah Mining Co., at Goldfield Junction. It is a straight cyanidation mill. The ore is to be crushed by a hundred 1,050-lb stamps in cyanide solution; the pulp classified in 10 coarse classifiers; and the coarse product from these to be re-ground in five 5-ft. Huntington mills to 50 to 60 mesh. All of the pulp is then to go to 20 fine classifiers for double classification; the slime going to nine slime vats provided with agitator arms. The sands go by means of Butters distributors to sand-collecting vats provided with slime overflow-gates, effecting a further elimination of slime. From the sand-collecting vats, the sand is removed by an excavating machine, and is delivered to a belt conveyor, feeding a centrifugal distributor which lays down the sand in a leaching vat. The slime is to be treated by the decantation process, the slime vats being provided with horizontal agitator arms on a vertical shaft. A filter-press is used for clarifying the slime-solution before precipitation. Ordinary zinc precipitation is employed; a reverberatory drying-furnace, with a hearth of 6 by 10 ft., will be used to dry the precipitate, which is then smelted in tilting furnaces.

In Storey county, on the Comstock lode, the Butter's Co. has been operating its 200-ton plant, on dump material during the year. In Lincoln county, the Janet Mining Co. has erected a small plant, using the Holderman filter-tank process. Several small mills are in operation in the Search Light district. The Bamberger de La Mar plant has been in operation throughout the year.

In *Idaho,* the Lincoln mine, at Pearl, Boise county, has installed a 150-ton plant. The Gold Dust and Bitter Root mines, in Lehmi county, have installed cyanide plants, as has also the Iron Springs Co., in Washington county.

In *New Mexico,* the Ernestine Mining Co. (at Mogollon, in Socorro county) has installed a cyanide plant to treat tailing from a 20-stamp mill, after concentration.

In *Arizona,* the Congress mine (in Yavapai county), and the Gold Roads mine (in Mohave county) have been in operation, as well as several other small plants.

In *Utah,* the Mercur Co. has operated more successfully than in the year previous; the mills of the Stateline district have been in operation.

In *Oregon,* in Baker county, the Virtue Co. has installed a cyanide plant; the Mayflower Co. is operating a new plant.

In *Washington,* the Nooksack Mining Co. has put its 200-ton plant in commission.

In *Montana,* cyanidation has been very active, although no new plants of importance have been erected during the year. The plants at Kendall have operated largely and successfully during the year. The Kimberly Montana, at Jardine, and all of the other well known mills in the State have been in operation.

In *South Dakota,* the two Homestake plants, the Golden Reward, Imperial, Dakota, Wasp No. 2, Spearfish, Maitland, Gilt Edge Maid and Puritan companies, have been in operation. The large plant of the Horseshoe Co. was in operation until destroyed by fire last May. This company will remodel its Pluma plant, and be ready to treat ore in the near future. In the Squaw Creek district, the Victoria and Eleventh Hour companies are constructing dry-crushing plants; the Reliance Co., at Annie Creek, will erect a plant. The Hidden Fortune, Alder Creek, and Deadwood Standard plants are not in operation.

The Electric Furnace for the Manufacture of Phosphorus.

La Revue Mineralurgique states that electrically heated retorts are better adapted than those formerly used for the production of phosphorus, inasmuch as cheaper crude materials may be employed; the temperature is more easily regulated; a purer product is obtained; and the use of sulphuric acid is avoided, which, in the old process, vigorously attacked the retorts, causing leaking and loss of output.

The method consists in heating a mixture of bones, quartz sand and charcoal, to a high temperature, the silica combines with the calcium of the bones to form calcium silicate, and the phosphorus distills over in a current of carbon dioxide. With the ordinary methods of external heating, simple clay retorts will not attain the necessary temperature; phosphorus does not begin to distill below 1,150° C.; and the distillation is not completed below 1,400 to 1,500° C.

In Germany (where already one-third of the output is obtained by the electric method), iron retorts, lined with fire-clay, and internally-projecting carbon electrodes, are used. The process is continuous, since the calcium silicate may be drawn off at the bottom, while the charge is fed into the top. Special precautions are taken to keep the upper portion of the furnace and the condensing pipe cooled below 290° C. (the boiling point of phosphorus), in order to avert explosions.

Leaking through the seat when closed is the principal and most annoying of valve troubles, and is due to irregularity or unevenness of the seat or disc, which prevents perfect contact. Poor installation, lack of care, or abuse are usually the cause of this trouble when good valves are used.

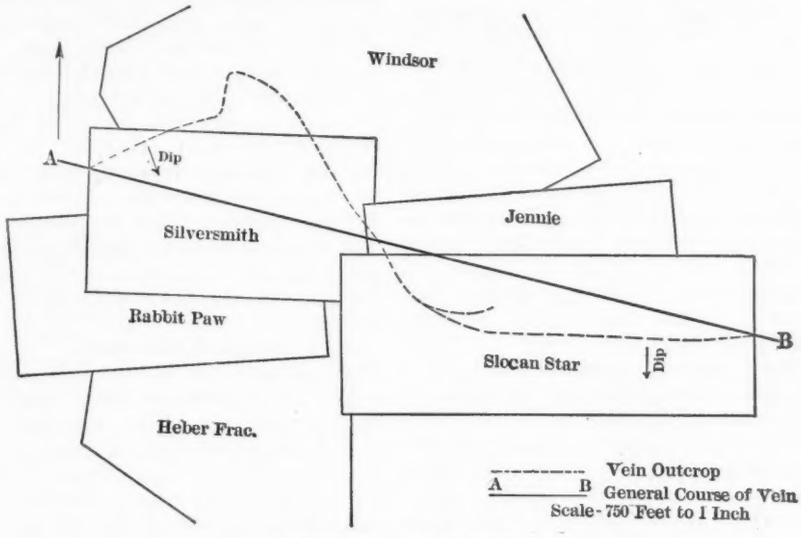
The average weight of a steam boiler and engine per horse-power is from 800 to 1,500 lb. That of a single cylinder stationary gas-engine, 200 to 400 lb., and of multiple cylinders much less.

The Star-Silversmith Case.

The decision of Chief Justice Hunter, of British Columbia, in the famous mining case of the Star Mining and Milling Company against the Slocan Star Mining Company was recently handed down. The properties of these companies are situated at Sandon, Slocan district, B. C. The judgment sustained every contention of the defendants, the Slocan Star Company, and dismissed with costs the action of the plaintiff company.

It was an action for damages and an injunction arising from the taking of ore by the defendants from the Rabbit Paw and Heber fractional mineral claims owned by the plaintiffs.

This ore was admittedly taken from within the limits of the said claims, and the defendants justify under the law governing their claims known as the Slocan Star and Silversmith, that is to say they allege that they are entitled to the ore belonging to a vein the apex of which is on their own claims and which they have in the course of mining followed down into the plaintiffs' ground.



STAR-SILVERSMITH CLAIMS.

At the trial a large mass of evidence was given in support of the respective theories, the plaintiffs claiming that the Slocan Star vein was cut off as already stated by the Black Fissure, and the defendants maintaining that the Slocan Star vein continues around point B to a point A, on the accompanying map, and connecting with the Silversmith vein, which they were working at the same level and, in fact, that the Silversmith and Slocan Star constitute one and the same vein.

The mountain on which the claims are, looks towards the north and the vein works backwards with depth towards the south. The defendants sank a shaft from their fifth level and worked thence westerly into the plaintiffs' ground, as they contend along their vein, and it is from this drift that most of the ore in question has been taken.

The plaintiffs claim that in so doing the defendants have not been pursuing the Slocan Star vein, but that this vein is cut off by what they term the Black Fissure, which extends from a point at or near the head of the shaft on the fifth level in a northwesterly direction to the sharp turn in the vein, and beyond into the slates.

Judge Hunter himself, accompanied by the engineers of the rival companies, visited the underground workings as well as a series of exposures laid open along the outcrop, and came to the conclusion that the Slocan Star and the Silversmith veins are identical, and that, although it is barren and badly shattered at the point indicated by the plantiffs as the position of the Black Fissure, the vein is continuous, and the alleged break does not occur.

Prices of Rare-Earth Ores.

BY CHARLES S. PALMER.

The term, "rare earth," while by no means vague, is one which includes several groups of elements. Some of these elements form oxides which are "earths," and which are chiefly used as such; for instance, in the mantles of gas lamps of the Welsbach type, and in the electric incandescent lamps of the Nernst type. But in all cases the elements at the base of these oxide earths are metals when isolated and purified. Many of these are now being used, as metals or alloys, in the new experimental lamps; such as the Siemens (tantalum), the Auer-Os (osmium), etc.

The application of these rare metals and their oxides to the skeleton glowers of incandescent lamp is itself a large one; but more important probably than this is the projected use of some of the rare metals in the production of alloys of iron and steel.

The market price of these rare metals is sometimes referred to as being "fictitious." This is rather a severe word to apply to the quotations of a market which is honorable in every sense, but which must perforce be provisional and tentative in quotations of material which is at present supplying an experimental demand. Some of the temporary quotations are as follows:

Vanadium ore, containing 3 to 5 per cent. Vd_2O_5, is rated at $5 per ton, f. o. b. cars.

Tungsten ore (with 70 per cent tungstic acid, WO_3), is quoted at $4 per unit, f. o. b. New York, or $280 per ton.

Molybdenum ore, high-grade concentrate, with 90 to 95 per cent. of the sulphide, $Mo S_2$, is worth 25 cents per pound or $450 per ton.

Tantalum ore, as tantalite or columbite, with, say, 22 per cent. of tantalic acid, Ta_2O_5, is quoted at $20 per unit, or $440 per ton.

Uranium ore, as pitchblende, is worth $2 per pound. High-grade picked ore or concentrate would thus run into the hundreds of dollars. Carnotite ore (low-grade sandstone), with 3 to 5 per cent. of uranium oxide, U_3O_8, calls for $5 per unit; or at 40 per cent., $200 per ton. But the high-grade hand-sorted ore calls for $1.50 per pound of contained uranium oxide; and at, say, 50 per cent. oxide, figures $1,500 per ton.

These figures of course will be greatly modified by the varying demand, by new finds, and by condition of long-time contracts. Also in several cases, tungsten for example, the supply is really greater than the demand.

Uranium Minerals.

E. Boubée describes (*Bull.* de la Soc. Geol. de France, Vol. 4, p. 345) a newly discovered occurrence of uranium minerals near Ambert, Puy-de-Dôme, France. It is a vein 6 to 8 meters wide, extending north and south for a distance of 1 kilometer. It shows three distinct phases: (1) Compact quartz and amethyst containing torbernite; (2) a completely altered pegmatite, of soapy feeling; (3) highly altered ferruginous quartz, cleaving into scales. In the fissures of this rock occur the tabular crystals of the uranite minerals, torbernite, and autunite, together with uranium ocher. The richness of the vein increases rapidly with depth. At 4 meters, samples were at least three times as rich as those at the surface.

To avoid the presence of pin-holes in brass castings, and still not give up the use of chips, make two melts. First, melt the chips and pour the metal into ingots. Re-melt these ingots and pour into the castings. This method has been used in many foundries with excellent results. The cost is against it, but against this is the making of castings without pin-holes.

The Transvaal.

BY W. FISCHER WILKINSON.*

The mining industry continues to expand, the returns again showing an increase over previous years. The production of gold during 1905 for the whole of the Transvaal will be about 4,900,000 oz., having a value of £20,800,000, or $100,000,000, the corresponding figures for 1904 being 3,779,621 oz., £16,054,809 or $77,865,823.

Although only a few new mines have been added to the producing list during the year, those that were crushing last year have in many cases increased their plant and output. The Witwatersrand mines that make returns this year (January to October), and not last, are the Consolidated Langlaagte, with 120 stamps; the Porges Randfontein, with 100 stamps; the Princess, with 50 stamps; the Orion, with 20 stamps; the Simmer & Jack East, with 100 stamps; and the Village Deep, with 110 stamps, the last two making their debut. The Wolhuter and Guinsberg mines lost mills by fire during the year.

The number of stamps at work in the Witwatersrand district in December, 1904, was 5,555; while there were 6,725 in operation in October, 1905. The stamp basis is not, however, any longer a good standard of comparison, owing to the recent introduction of auxiliary crushing machinery, such as tube-mills. It is desirable now to define the size of a plant—not, as is usually done, by the number of stamps, but by the tons it can treat. For instance, a mill of 100 stamps and two tube-mills could do about as much work as a 120-stamp mill without tube-mills, with stamps of equal weight.

TABLE 2. TRANSVAAL GOLD PRODUCTION BY YEARS.

(Chamber of Mines Returns).

Year.	Witwatersrand District			Outside Mines Value.	Transvaal Total.
	Tons milled.	Value.	Value per ton milled		
		£	s	£	£
1884–9	1,000,000	2,440,000	48.8	238,231	2,678,231
1890	730,350	1,735,491	47.4	134,154	1,869,645
1891	1,154,144	2,556,328	44.2	367,977	2,924,305
1892	1,979,354	4,297,610	43.4	243,461	4,541,071
1893	2,203,704	5,187,206	47.0	293,292	5,480,498
1894	2,830,885	6,963,100	49.2	704,052	7,667,152
1895	3,456,575	7,840,770	45.2	728,776	8,569,555
1896	4,011,697	7,864,341	39.2	739,480	8,603,821
1897	5,325,355	10,583,616	39.74	1,070,109	11,653,725
1898	7,331,446	15,141,376	41.3	1,099,254	16,240,630
1899 a	6,639,355	14,046,686	41.14	661,220	15,728,693
1899 b	233,395	1,020,787	.....		
1900	459,018	1,510,131	65.82	.....	1,510,131
1901	412,006	1,014,687	49.25	81,364	1,096,051
1902	3,416,813	7,179,074	42.00	74,591	7,253,665
1903	6,105,016	12,146,307	39.79	442,941	12,589,248
1904	8,058,295	15,539,219	38.46	515,590	16,054,809
1905 c	11,118,000	19,987,000	35.95	820,000	20,807,000

(a). Jan. to Oct. (b). Nov. to Dec., supplementary (incomplete). (c). Estimated.

Last year I called attention to the decrease in the yield per ton; as this is a matter which is disquieting some people, I again explain that it is the natural result of the increased scale of operation; of the inclusion of poorer mines in the list of crushing companies; and of a reduction in the cost of working. In the early days it was the richest mines that came into operation first; the average grade of ore sent to the mill was comparatively high. As larger plants were put up it was possible to lower the grade (in many cases) without reducing the profit. The effect of the reduction in grade has been to raise the available tonnage of a mine, and consequently to lengthen its life. The lower the grade that can be profitably worked the less waste will there be of the gold that Nature has provided. It is safe to predict that the average yield-per-ton-milled of all the mines will gradually fall; and it should be regarded as a healthy phenomenon, which must broaden the field of operations.

TABLE I. TRANSVAAL GOLD PRODUCTION FOR 1905.

(Chamber of Mines Returns.)

Month. 1905.	Witwatersrand Mines.					Outside Mines.	All Transvaal.
	No. of Companies.	Tons Milled.	No. of Stamps.	Fine Gold, Oz.	Value.		
January	62	835,823	5,740	357,214	£1,517,349	£51,159	£1,568,508
February	63	801,320	5,876	351.052	1,491,174	54,197	1,545,371
March	63	907,620	6,195	385,575	1,637,818	60,522	1,698,340
April	64	898,871	6,345	385,394	1,637,050	58,500	1,695,550
May	63	956,857	6,542	400,149	1,699,725	69 009	1,768,734
June	63	935,245	6,620	396,188	1,682 900	68,512	1,751,412
July	62	958,214	6,640	401.121	1,703,854	78,090	1,781,944
August	64	988,151	6,835	410,859	1,745,218	75,278	1,820,496
September	63	940 918	6,770	399,536	1.697 121	72,003	1,769,124
October	63	959,844	6,725	397,868	1,690,036	75,011	1,765,047
November*	....	960,000	.....	400,000	1,700,000	72,250	1,772,250
December*	....	980,000	.....	420,000	1,785,000	85,000	1,870,000
Total	....	11,117,863	.....	4,704,956	£19,987,245	£819,531	£20,806,776

*Nov. and Dec. figures are estimated.

As in previous years, I give tables showing the monthly tonnage treated, and the gold production for the year under review, as well as for previous years. Between January and October, 1905, there was an increase of 16.2% in the tons milled, and of 113% in the gold won.

The cost of working the mines is gradually being reduced, mainly by reason of improvements in the methods of mining. The conditions under which the mines are operated have not improved to any great extent since the war. It is true that explosives are cheaper; but skilled and unskilled labor (the large items amounting to from 50 to 60% of the operating costs) are much as they were. White wages remain high, owing to the high cost of living. A paper read before the British Association (which visited South Africa during the year) gave the average monthly expenses of a married man, with wife and three children, at nearly £25 per month. Supplies, excepting explosives, are, on the whole, no cheaper, as railway rates and customs duties are still high. The list given herewith shows the prices paid at one of the mines in 1899 and 1905:

The only item which shows a substantial reduction is explosives, which has been reduced from 97s. 6d. a case in 1899, to 57s. in 1905. Explosives account for about 9% of the total mining costs, so that the saving under this head amounts to only 4% over pre-war costs. The increased economy may be chiefly attributed to improved methods of mining. Perhaps the most important reductions are due to the introduction of piece-work wherever possible. This has been done with beneficial results, both to employer and employed, especially in mines working with Chinese, who prefer working on contract.

Much attention has been paid to the all-important subject of working costs. Although the majority of mines keep the most detailed accounts, yet a comparison of different periods is not an easy matter, as it necessitates an inquiry as to whether the conditions (such, *e. g.*, as the stoping widths, the labor supply, the amount written off for development, the scale of operations, etc.), are the same over the periods compared.

I give herewith figures comparing the costs for two periods, of the Simmer & Jack mine; the mine was operated in one period with Kaffirs, and in the other with Chinese labor. It is unfortunate that the number of stamps working during the two periods was not the same, but the figures would only be slightly affected by the difference. It must also be noted, that during the 1905 period many of the Chinese were new arrivals and inefficient. Later months show a reduction in costs, that for October being 20s. 0.767d. per ton milled.

The cost of working may be reduced in the future, owing: (1) to the larger scale of operations, which will tend to reduce fixed charges; (2) to the more extended adoption of contract work; (3) to the use of small machine drills; and (4) to a reduction in the cost of supplies.

The introduction of the small machine drills to take the place of hand drilling has not yet proved a success on this field. Attempts have been made in this direction, but so far no drill of this class has been installed on a large scale on any mine.

*Consulting engineer, Consolidated Gold Fields of South Africa, Ltd., Johannesburg, S. A.

The experiments thereto, however, have been encouraging, and there is good reason to hope that a serviceable drill will be manufactured before long. The introduction of a good machine drill that could be used by unskilled labor in the stopes would be of great importance to the industry; it would at once go a long way to solve the most pressing problem of the day—the dearth of unskilled labor. Supposing a good reliable machine were invented (with which an unskilled laborer could drill four or five holes per shift, instead of one as at present), the number of unskilled laborers required would at once be reduced in proportion. Especially is this of importance for the deep-level mines, where the time and expense of transporting the labor, to and fro, is a serious problem. A small drill has been in operation for some weeks in one of the mines, which has given encouraging results; while it is not perfect, it may prove satisfactory when certain structural defects are remedied.

TABLE 3. COMPARISON OF PRICES.

Articles.	July, 1899.	July, 1905.
Acid, Sulphuric ..... per lb.	2½d	2¾d
Bolts and Nuts ..... per cwt.	31 to 35s	25s 6d
Cyanide ..... per lb.	1s 0d	10.63d
Cement ..... per cask	45s 4d	28s to 30s
Ceiling, Oregon ..... per ft.	3¾d	3⅞d
" Baltic ..... "	3¾d	2½d
Candles (Cranes) ..... per box of 25 lbs.	9s 9d	9s4½d to 8s6¼d
" (stearic acid) ..... " "	19s	16s
Detonators ..... per box of 100	4s (No. 6)	5s 9d (No. 8)
Deal ..... per cu. ft.	4s 11d	8s
Explosives, gelatine ⅞ inch ..... per case of 50 lbs.	97s 6d	57s
Fuse ..... per coil	4 1/16d	4d
Flooring ..... per ft.	5d	4½d
Iron, bar ..... per cwt.	16s 8d	14s 6d
Iron, galv. corrugated ..... per ft.	6½d to 7d	5⅝d
" plain ..... per 100 lbs.	23s	22s
Karri Wood ..... per cu. ft.	7s	7s
Lime, white ..... per cask	5s 3d to 6s 2d	7s 9d
" blue ..... "	4s 6d	3s 6d
Meat ..... per lb.	5d	3½d
Mercury ..... per flask	£10	£8 10s
Nails ..... per cwt.	19s to 25s	17s 6d to 20s
Oregon ..... per cu. ft.	3s 9d	3s
Pitchpine ..... "	5s 6d	3s 6d
Paraffin ..... per case	13s 9d	12s 3d
Rails ..... per cwt.	11s 4d to 12s	12s 4½d
Screening, battery ..... per sq. ft.	5d	4½d
Steel, octagon ..... per lb.	5½d	5½d
" cruciform ..... "	5½d	5½d
Zinc discs ..... "	5d	4d to 4 1/32d

Chinese labor has continued to arouse public interest, both in South Africa and in Europe. Outside South Africa, and even in South Africa itself, except on the Rand, the situation was little understood. Most extravagant and misleading accounts were circulated as to the behavior and treatment of the Chinese. By some, the employers were pictured as the most brutal of taskmasters; others represented the Chinese as lawless, and a danger to the community. It seems scarcely necessary (seeing that the Transvaal is a British colony) to deny that the Chinese are subjected to ill-treatment; the mines are open to inspection to all the world. It is generally admitted that the Chinese are well fed and well cared for, and that they live "in clover" here, as compared with their own country. What gave rise to the rumors of ill-treatment were the so-called "desertions" of the Chinese from the mines. Owing to loose supervision, considerable numbers of the Chinese absented themselves from the mines where they were supposed to be at work. On investigation, it was found that a large number of the absentees were loafers about the mine who did not trouble to turn up at the roll-call. Food could be obtained whether they worked or not, and hiding in some sunny corner was preferable to doing a day's work in the mine. Others again, influenced by the spirit of adventure or curiosity, wandered off into the country; it is probable that the cases of attacks on lonely farm houses originated from hunger, and that the outrages were not premeditated. On the other hand, it is probable that the attacks on stores in the mining area were organized from the motives of revenge on the storekeepers for cheating the Chinamen. At any rate the desertions were not due to ill-treatment. As soon as it was found out that many were absent from the mines, a general search was made; the loafers or deserters, the most of whom were discovered in the neighborhood, were brought back to the mines. The Chinese appear to be quite contented with the conditions under which they live. They spend their money freely, the bicycle being the most popular purchase. They have their own theaters, and present plays which apparently give every satisfaction to the audience. At one mine they have a brass band which already performs western music very creditably. From an economic point of view the experiment has been a decided success.

The number of Chinese employed on the Witwatersrand gold mines at the time of writing (Oct. 1905) is 45,956, representing 32.2% of the total unskilled labor supply. The Chinese are distributed over 34 mines; the largest employer being the Simmer & Jack Proprietary mine, which had in October 4,309 on its books. The work done by the Chinese compares favorably with that of the Kaffirs; the mines employing Chinese are now worked as economically as the mines worked entirely by Kaffir labor. The introduction of this new class of labor was not accomplished without many difficulties. The Chinese were strange to the country, strange to the work and unable to make themselves understood. Misunderstandings were at first frequent, and accounted no doubt in many cases for disputes with white miners. Among the Chinese first imported were many bad characters; many disturbances have been due to their evil influence. Steps have been taken to repatriate the ringleaders, and, speaking generally, the work now goes on smoothly. The Chinese live in separate quarters at the mines, and are allowed to move about freely within the mining area under a system of passes.

The opponents of Chinese labor contend that the introduction of this foreign element has curtailed the employment of white men. This, however, is not the case; on the contrary it can be shown from statistics that the number of white men employed on the mines has largely increased since the introduction of Chinese.

TABLE 4. COMPARISON OF COSTS PER TON MILLED—SIMMER & JACK PROPRIETARY MINES.

	Average Recovery.	No. of Stamps.	Average Sorting.
1899—April to June	33s. 10.731d.	280	19.8%
1905—April to June	31s. 7.748d.	320	18.5%

	April-June 1899. d.	%	April-June 1905. d.	%
European labor	77.299	32.0	85.446	33.0
Colored labor	38.523	16.0	41.887	16.2
Compound expenses (including food and supervision)	25.722	10.7	36.993	14.3
Supplies	77.725	32.2	73.529	28.3
General	22.066	9.1	21.386	8.2
	241.335	100.0	259.241	100.0

TABLE 5. OCTOBER, 1905, COSTS—CLASSIFIED BY DEPARTMENTS.

	Cost per Ton on 52,800 Tons Milled. s.	d.
Mining	10	2.113
Development redemption	2	6.000
Hauling and pumping	1	9.524
Transport of ore		2.091
Crushing and sorting		7.781
Milling	1	9.856
Cyaniding sand	1	5.992
Cyaniding slime		6.606
General charges and sundries		10.804
	20	0.767

In May, 1904, before the introduction of Chinese, the total number of natives employed on the gold mines (according to the statistics of the Government Mines Department) was 77,519, and the total number of whites 13,127. In the month of October, 1905, the unskilled labor force was: Natives, 96,392; Chinese, 45,956; or a total of 142,348; while the number of whites was increased to 18,359. These figures demonstrate that the increase in the unskilled-labor supply has largely increased the employment of white people. It must also be remembered that the increased employment of white men on the mines means also that other white people can earn a livelihood in commercial pursuits.

As regards the supply of Kaffir labor, the demand continues to be largely in excess

of the supply, in spite of the most active recruiting. The total natives available for mining and "other employ" (Sept., 1905), exclusive of natives employed on farms, has been estimated at 177,061; of which number 85,634 found employment on the mines. The demand for labor for "other employ" is an increasing one.

TABLE 6. LABOR STATISTICS (MINES DEPARTMENT). PERSONS EMPLOYED IN GOLD MINES AT END OF MONTH.

	White.	Colored.	Chinese.
1902—July	8,162	32,616	.....
December	10,292	45,698	.....
1903—June	11,825	66,221	.....
December	12,695	73,558	.....
1904—June	13,413	74,632	1,004
December	15,023	83,639	20,885
1905—June	16,989	104,902	41,340
October	18,359	96,392	45,956

The number of persons employed on all mines of the Transvaal at the end of October, 1905 was: White, 19,708; colored, 112,119; Chinese, 45,956.

TABLE 7. TRANSVAAL LABOR, 1905.

Employed at end of each month. (Chamber of Mines.)

Month. 1905.	Natives, Witwatersrand.	Outside Districts, excluding Barberton.	Total Natives.	Chinese.	Total Natives and Chinese.	Natives Employed by C. S. A. R., S. A. C., P. W. D. and other Departments.
Jan....	76,040	5,405	81,445	27,197	108,642	19,739
Feb....	84,186	5,181	89,367	31,389	120,746	20,477
March.	90,290	4,314	94,604	34,282	128,886	20,261
April..	92,084	4,130	96,214	35,516	131,730	19,732
May...	91,647	4,579	96,226	38,066	134,292	19,251
June...	88,843	5,145	93,988	41,290	135,278	19,149
July...	86,375	5,298	91,673	43,140	134,813	18,590
Aug....	83,370	5,459	88,829	44,562	133,391	18,025
Sept...	80,306	5,328	85 634	44.488	130,122	.....
Oct....	78,541	5,134	83,675	45 901	129,576	.....
Nov. ...	.....	.....	.....	.....	.....	.....
Dec....	.....	.....	.....	.....	.....	.....

During the past year a considerable amount of railway construction has been undertaken, which will help the outside mining districts. The most important new line (which is now near completion) is that connecting the present Johannesburg-Klerksdorp line with the main trunk line between Cape Town, Kimberley and Bulawayo. The line follows the Vaal river, joining the main line, to the north, at Fourteen Streams. There is a branch line from Eastleigh Junction to the Vierfontein and Groenfontein collieries. The distance between Johannesburg and Kimberley by the new route will be shortened to 308 miles, while a saving of several hours will be made in the journey to Cape Town. Another projected line is to connect Krugersdorp, Kleinfontein and Zeerust, which will no doubt ultimately be continued to Mafeking. North of Pretoria a new line to Rustenburg is being constructed, of which about 21 miles are nearly completed. Toward the east the Johannesburg-Brakpan line is being extended to Witbank, to connect with the Delagoa Bay line. This will shorten the route for the coal traffic from the Midburg coalfield to the Rand. A new line is also projected to connect Delagoa Bay and Johannesburg, *via* Bethal and Swaziland, which will provide better gradients than the Witbank-Brakpan line.

The profits of the gold mines have allowed of dividends being declared for the first six months of 1905 of £2,066,991; the amount distributed for the year may be expected to reach £4,500,000—a figure aproaching the record year of 1898. A table is given herewith.

TABLE 8. DIVIDEND LIST OF GOLD MINES OF THE TRANSVAAL.

Year.	£	Year.	£
1887.....	12,976	1897.....	2,707,181
1888	112,802	1898.....	4,848,238
1889.....	432,541	1899.....	2,946,358
1890.....	254,551	1900.....	.....
1891...	334,698	1901.....	415,813
1892.....	879,320	1902.....	2,121,126
1893.....	955,358	1903.....	3,345,502
1894	1,527,284	1904.....	3,911,093
1895.....	2,046,852	1905*.....	4,500,000
1896.....	1,513,682		

*Estimated.

Metallurgical Improvements.—The most important development has been in connection with finer reduction of the ore to obtain higher extractions, largely due to the success of the decantation process for the treatment of slime. Fine crushing can be carried out, either by using heavy stamps with finer screens in the battery and higher discharge, or by the use of tube-mills, or other grinders, for the coarser portion of the tailing. While the advantage of finer grinding has been demonstrated, yet the best method of carrying it out has not as yet been finally decided on. With a modern plant, an average extraction of 90% on ore of a value of 10 dwt. and upward can now be relied on; the development above noted is expected to raise this to 95%, whereas a few years back the average extraction was between 80 and 85 per cent.

As regards the use of tube-mills, several have now been installed. They may be employed: (1) to increase the tonnage crushed, a coarser screen than usual being used in the battery; (2) to carry, where so desired, the reduction of the ore to a finer point than is economically possible in the stamp battery; (3) to slime the pyritic concentrate, when concentrators such as Wilfleys or Frue vanners are installed below the plates.

On the East Rand new mills are being constructed to work on the last-mentioned principle. Practice (1) is employed at the Knights Deep, where 200-mesh screen is used in the 100-stamp battery, giving a duty per stamp per 24 hours of well over 7 tons. The coarser portion separated by spitzlutte after leaving the plates passes through two tube-mills; the final cyanide residues have an average value per ton as low as is obtained by ordinary milling practice. Practice (2) is employed at the Robinson Deep, where the pulp from the plates is hydraulically sized, the coarser sand amounting to 50%, with returns passing through the two (22 ft. by 5 ft. diam.) tube-mills. The aim of the mill man here is to obtain, in his final pulp going to cyanide works, a small percentage of sand coarser than 60-mesh. The work done by the tube-mills is estimated in terms of the tons reduced from plus 60 to minus 60 and the increase in minus 90 mesh. At the Robinson Deep (during August, 1905) the pulp leaving the 200-stamp battery contained 27% coarser than 60-mesh, and 54% finer than 90; the pulp overflowing the tube-mill spitzlutte contained about 6.75% coarser than 60, and 79.3% finer than 90. A table given herewith shows the comparative results on the cyanide residues of this mine, when milling with, and without, tube-mills:

1905.	Tons Crushed by Battery.	Average Value Residue.	Screen used in Battery.
Average Jan. to March, without tube-mills.....	26,872	1.26	1,000 light
August, with 2 tube-mills.....	29,173	0.78	800
Increase in extraction.....	.....	0.48	

The tube-mill working-costs were 1s. 0.92d. per ton ground, and 5.88d. per ton milled, giving an additional extraction of 0.48 dwt. per ton milled, or 2s., and an additional profit credited to tube-mills of 1s. 6.12d. per ton milled.

In cyanide works, economy is shown by the use of bisulphate of soda (a by-product of the dynamite factory), in place of sulphuric acid, for refining the zinc-box precipitate. This saving amounts to two-thirds of the present cost of sulphuric acid.

A process for treating the cyanide residue dumps (which are now assuming enormous proportions) is being developed by H. S. Stark. The foundation of this process is the leaching of the dumps *in situ* with sulpho-cyanate solution and an oxidizer; and precipitating the gold from the acidulated solution on scrap iron. The process is now in use at several mines; few details are available as to the economic results. An application for patent rights on this method has been opposed.

As regards the values of the dumps, it is popularly supposed that the old dumps are far richer (owing to the lower extraction in the past) than those now being made, which contain on an average about 1 dwt. of gold per ton. It must, however, not be lost sight of that, as time goes by, natural leaching of the dumps takes place; any soluble gold discharged with the residue in the weak-cyanide solution adherent as moisture, or as gold subsequently dissolved in the dump by this cyanide solution, is gradually washed out by rain and lost. It is only the presence of encased gold, inaccessible to the cyanide solution, that may then make the dump worth retreating, when regrinding will be necessary.

Diamond Mining.—This is now an important industry, the famous Premier mine near Pretoria accounting for the greater part of the production. On Jan. 25, 1905, the largest stone hitherto known was discovered. It has been named after the chairman of the company, the "Cullinan

Diamond." It weighs 3,024⅜ carats, or 1.37 lb. avoir. It measures 4 by 2½ by 2 in., and is a crystal of remarkable purity (this JOURNAL, Mar. 23, 1905, p. 554). The recent production of diamonds is given herewith:

TABLE 9. TRANSVAAL DIAMOND OUTPUT.

	Weight, K.	Value, £.
Statistical year 1902-3	33,572.57	46,358
" " 1903-4	497,917.14	685,720
" " 1904-5	995,002.51	1,198,530
1905—July	57,225.75	67,203
August	69,536.25	76,544
September	61,977.25	68,661
October	57,632.94	67,270

Tin.—A discovery was made during the year about 50 miles east of Pretoria, on the farms Enkelsdoorn and Vlaklaagte. The tin occurs in lodes in red granite, and in rich irregular deposits in greisen. As to the extent of these deposits very little is known. There has been reckless speculation in the shares of the companies formed to exploit the district; the capitalized value of the properties has reached dimensions out of all proportion to the development work done.

The scientific societies of Johannesburg have been busy during the year, which was one of exceptional interest, owing to the visit of the British association. Among new publications "The Geology of South Africa," by Drs. Hatch and Corstorphine calls for special mention. Another event is the appointment by the Government of a committee to inquire into and report on the safety of mining ropes.

No mention has yet been made of the non-producing mines; of these there were at work (during Sept., 1905) 39 in the Witwatersrand district, and 23 in the outside districts; giving employment to 3,877 whites, 14,746 colored persons, and 4,630 Chinese. These mines include several that are rapidly approaching the producing stage. Work in the eastern section of the Witwatersrand has been especially active, and mining is now carried on in almost a continuous line for 25 miles east of Johannesburg, as far as the farm Geduld. The main reef has been traced, by bore-holes, further east to Palmietkuilen, from which place it takes a turn to the south. As the extension of the reef is traced, the permanency of the mining industry becomes more assured.

Recent Copper Smelting at Lake Superior.

BY L. S. AUSTIN.*

Delivery of Mineral.—"Mineral" is the mixture of native copper with rock gangue. This is loaded at the stamp or concentrating mill into side-dump tram-cars having a V-shaped bottom and of a capacity of one to two tons. These cars are themselves loaded transversely upon railroad flat-cars and are thus transported by rail to elevated trestles at the smelting works. The tram-cars are now taken to the hoppers, which command the reverberatory furnaces and there dumped. This method is much superior to the old way of handling the mineral, which used to be barreled up and thus transported.

At the Michigan smelter, however, the mineral is received in the large hopper-bottom railroad cars, also on an overhead trestle. They are discharged into a transfer car moved by an industrial locomotive; the load is there weighed and then dropped into one of ten vertical steel storage bins, each of 250-ton capacity.

Size of Furnaces.—Up to the time of the construction of the Michigan Smelter the largest furnaces in the region had a hearth 17 by 28 ft. This new plant built a fusion furnace, 20 by 50 ft., which was finally given up as being too large. The present furnace which has taken its place is 16 by 35 ft., and has been furnished with a 24-in. ventilated bottom, composed of two thicknesses of 12-in. silica brick, set on end. This has been found to do satisfactory work and to stand the severe usage of copper smelting. Herewith is given a section of this furnace.

For smelting down and refining the higher-grade mineral, also scrap and cathode copper, the regulation furnace of 13 by 17 ft. is generally used. At the Michigan Smelter, however, the refining furnace has a 14 by 22 ft. hearth.

Treatment of Charges in the Reverberatory.—In treating charges, either of the two following methods may be followed:

The *first* consists in melting down the charge in the large melting or fusion furnace; skimming off the slag; and then tapping the crude copper to a refining furnace. Here it is rabbled by using a gas pipe through which compressed air is blown into the copper; by this it is oxidized. The copper is then poled to bring it to "pitch." Then it is dipped and molded to form cakes, ingots or wire-bars.

The *second* method consists in performing the operations both of melting down and of refining, in the last or refining furnace.

Moulding or Casting the Copper.—Of

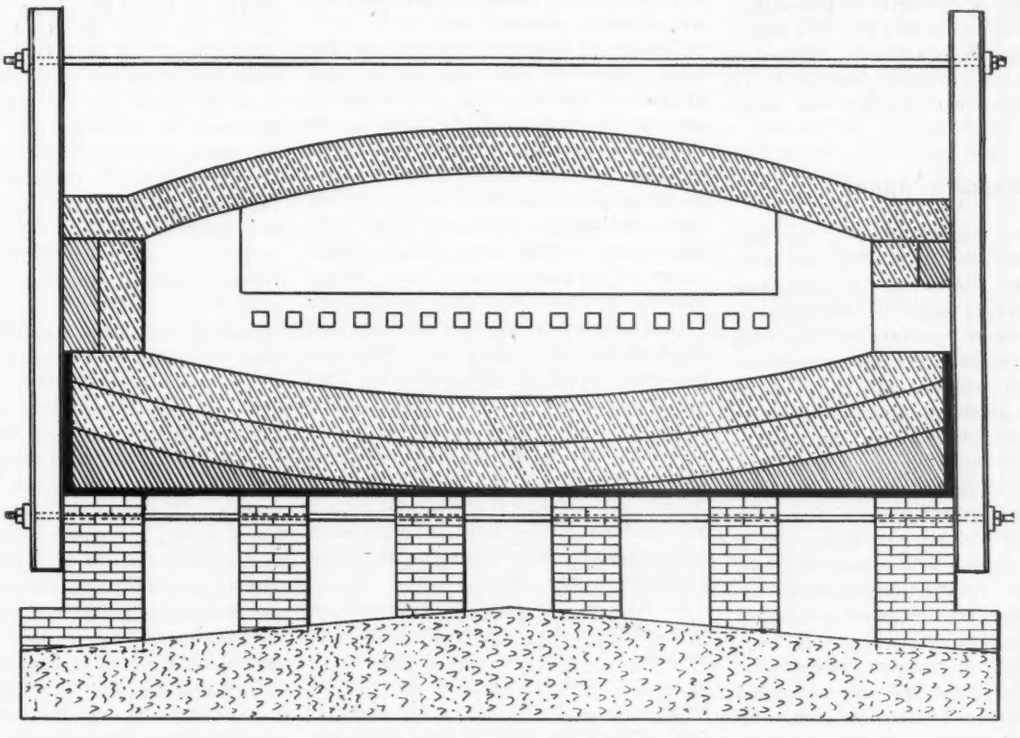


FIG. 1. CROSS-SECTION OF 16 BY 35 FT. FUSION FURNACE, LOOKING TOWARD THE FIRE-BRIDGE.

*Professor of metallurgy, Michigan College of Mines, Houghton, Mich.

the several methods used, the Calumet & Hecla plant still sticks to dipping with hand ladles. It claims that a better-looking ingot is made by so doing. At other works a considerable saving in labor is effected by the use of large or "bull" ladles; these are suspended from a trolley moving on an overhead track. Casting machines are used, both of the endless-chain and of the Walker type. At Dollar Bay, the moulding, even to the endless-chain machine, is done by the trolley ladle. At the Michigan Smelter, the copper is cast, through a tipping ladle, direct to the moulds of the Walker casting machine.

Smelting Reverberatory Slag.[1]—At two of the works the slag is smelted in furnaces of the matting-reverberatory type; these have a crucible. The impure copper is tapped periodically from the crucible, and the slag flows continuously from a trapped spout into a fore-hearth. This hearth, 6 ft. in its shortest dimension, serves as a guard for settling out any possible escaping copper. The slag overflowing from the fore-hearth is granulated, and in one case, washed away to a dump. At the Dollar Bay plant, it is elevated to an overhead bin. From the bin it is drawn off in wagons and dumped on waste ground.

Magnetic Alloys.

The London *Electrician* (Nov. 24, 1905, p. 225) states that B. V. Hill has made some further discoveries in connection with the magnetic alloys of non-magnetic metals discovered by Heusler. He finds that they show an irreversibility with regard to high temperatures, just as the nickel steels show an irreversibility with regard to low temperatures. He worked with an alloy containing 60% copper, 25% manganese, and 15% aluminum; and with another alloy containing more aluminum. The latter showed an induction of B = 5,750, c. g. s. in a field where H = 87 c. g. s., with a comparatively large hysteresis. It was then subjected to repeated heating and cooling.

Starting with a magnetic intensity of 311 units, the curve fell till it reached the axis at 320°. On cooling, the magnetization was found to be only 267 units. On heating again, the magnetization did not disappear completely, but remained as high as 7 units up to 500°. On cooling, it appeared much diminished, being only 27 units at ordinary temperatures, and 36 units at the temperature of liquid air. Mr. Hill attempted to restore the magnetization by heating to dull redness, but only attained an intensity of 90 units. Heating to a bright red made this 155 units; and subsequent exposure to liquid air, 165 units. The other alloy, heated to 950°, lost its magnetism permanently and became 14% lighter. The nickel steels are heavier in the non-magnetic state.

[1] The rich slag, containing much cuprous oxide, is skimmed off at the end of the poling; it was formerly reserved to add to the following charge. The practice has so far changed that all reverberatory slags, without distinction, are sent to the cupola furnace for final recovery of their contained copper.

Oil and Gas Development in the Mid-Continental Field in 1905.

BY ERASMUS HAWORTH.*

Geography and Development. — The term "mid-continental field" applies to the oil-and-gas fields of Kansas, Indian Territory and Oklahoma. The area may be defined approximately as follows: From Kansas City draw a line westward to Lawrence, Kansas, a distance of about forty miles; thence south and west, by way of Ottawa, Moody, Toronto and Sedan to the south line of Kansas; continue in the same general direction to Cimarron river in the Indian Territory; from there extend the line nearly southeast by way of Sapulpa to Muskogee, and thence in a general northeasterly direction by way of Chelsea, Vinita and Oswego back to Kansas City.

Outside of this area a number of outlying discoveries have been made; such as gas at Arkansas City and Newkirk; and oil and gas near Ardmore in the Chickasaw Territory. The Arkansas-City Newkirk field is evidently about the same geologically as the large field; but the exact geological conditions about Ardmore (and a few other places where traces of oil and gas have been found) have not yet been thoroughly worked out.

Development during 1905 has extended the fields by only a small area. More gas has been found at Arkansas City than was thought to exist. The heavy developments about Pawhuska in the Osage Territory, and in the oil fields of Cleveland, Oklahoma, and the shallow oil about Alluwe and Coody's Bluff, are the principal additions for the year, although small developments were made in all these places at an early date.

In Kansas, the only developments of note were in the vicinity of Paola and Rantoul. A somewhat unexpected development of shallow oil has been made about Paola; it was unexpected because much drilling for gas had been done previously without uncovering oil pools. Rantoul is a little village on the Missouri Pacific railroad, between Ossawatomie and Ottawa. Early in the year a number of wells were drilled there, which, almost without exception, produced either oil or gas in paying quantities. At present, a nice little field of shallow sand is developed, producing fair quantities of both oil and gas. This seems to be a southwest trend of the Paolo-Ossawatomie field. The pay-sand lies at varying depths, from 350 to 600 ft. or more.

Alluwe, in the Cherokee Nation, is a little village which until a few months ago consisted of some half a dozen houses, including a little country store, or trading post. This was the former home of the Delaware chief, Little Foot, and the present home of his son-in-law, Mr. Campbell, who now has a princely income from royalties on oil leases. Two or three years ago, two prospect wells were put down ostensibly for water. Each of them struck oil-sand at about 500 ft., and the wells stood full of oil for two years or more. When leasing in the Cherokee Nation began in earnest a year and a half ago, information about these wells leaked out and leases in that vicinity soon came to a premium. The old lease of the Cherokee Illuminating Oil Company, covering 12 sq. miles, lies six miles south of Alluwe. Development has proved a north-and-south trend, reaching all the way from the old lease (or "big lease," as it is generally called) to Coody's Bluff, ten miles north of Alluwe, forming a north-and-south trend known to be from 15 to 18 miles long. Here oil of good quality is found at depths varying from 300 to 650 feet. In daily capacity, the wells range from 10 to 500 bbl.; most of them flow from one to six weeks without pumping. This is the most important shallow-sand territory yet developed in the entire mid-continental area.

At Cleveland, the oil-sand is very deep (around 1,900 feet), with slight variations in different wells. The production ranges from 25 to 300 bbl. per well initial capacity, making this an important oil-pool.

Another new pool opened entirely in 1905, is located to the north and west of Dewey, four miles north of Bartlesville. The first development here was made by Stubbs and Low, early in the year, on a lease lying 1½ miles northwest of town. The oil-sand averages 1,400 ft. below the surface; although a shallower sand, about 800 ft. down, is a small producer in some of the wells. From this original development, in almost all directions new wells are frequently brought in. Early in November, a well two or three miles southeast of Dewey started flowing at the rate of 1,000 bbl. per day; at the end of a week it had settled to 450 bbl. A few good producers have been brought in still further northeast toward the Kansas line; but up to the close of the year there is left an unexplored zone nearly 10 miles wide between the developed area and the southern Kansas line, with good reasons for believing it may become as productive as any area yet developed.

The most extensive development throughout the year was in the areas fairly well proven during 1904. From the vicinity of Bartlesville southward, along the extreme eastern line of the Osage territory, a surprisingly large number of strong wells were brought in. A number of them have begun flowing at the rate of 1,000 bbl. per day, and have held weeks before dropping to 500

*State geologist, Lawrence, Kansas.

bbl. For matters of convenience, holders of the blanket lease on the Osage lands divided the eastern area into three north-and-south columns, approximately three miles wide per column. East-and-west lines were now drawn half a mile apart; each sub-area is called a "lot," and is numbered from the State line southward to the south side of the territory, a distance of 58 miles, making 116 lots in each tier. Practically all the land extending from Bartlesville to lot 70 or 75 is proven territory, with richer areas in certain places. Lots 44 and 45 are excellent, with another rich pool about lots 51 and 52; the richest of all is in the vicinity of lots 61 to 67. Here it seems almost impossible to find a dry well; numerous wells had initial capacities above 300 bbl. per day. West from this immediate area, on the middle tier of lots (that is, lots 169 to 172) there is also a productive area; and still west on the third tier (that is, lots 293-296), and in parts of Township 24, Range 10, still farther west, excellent oil pools have been developed. It seems probable that here is an east-and-west trend reaching from the east side of the Osage leases westward, a distance of 15 miles. The north-and-south development from Bartlesville to lot 68 is another stretch of excellent land, 18 miles long. East of the territory line, and within the Cherokee land in the vicinity of Ramona, a number of dry wells have been drilled, implying a limitation of the field on the east side.

Outside of the richest areas already described, other excellent pools have been developed in part. Thus, a zone reaches west and a little north from Bartlesville over into Range 10, which is dotted here and there all over with good wells. To the southwest across the river north from Cleveland, a number of good wells are found; again in the vicinity of Pawhusky, both oil wells and gas wells are found, which implies a profitable area. The development in different parts of the Indian Territory has been greater than to the north in the State of Kansas; due in part to better wells, and in part to legal considerations to be explained later.

In Kansas, development was not great during the past year. The Chanute-Humboldt pool, the Bolton pool, the Coffeyville pool, the Tyro pool, and the Caney pool, were tolerably well defined before the close of 1904; then a severe winter came on, and just at the beginning of milder weather the price of oil dropped so low that producers had no incentive to drill. In fact, for about six months (from February to July inclusive) it was impossible to market more than a small fraction of oil which might have been produced from the wells drilled. As a result, surprisingly few wells were drilled in Kansas. Chautauqua county witnessed more drilling than any other part of the State outside of Paola and Rantoul, already mentioned; partly because the grade of oil was highest here and commanded the highest market price; and further, on account of less uncertainty in drilling. Three miles straight south from Sedan, the county seat, is a pool known as the Huffman pool. Oil is obtained there at from 1,050 to 1,250 ft.; the wells range from 20 to 256 bbl. initial capacity, many of them making 75 bbl. after months of pumping. Two miles to the east, and from two to six miles south of the Huffman field, is an area trending north and south, about two miles wide and reaching down to the State line, commonly known as the Blundell-Spurlock area. This was the first developed in Chautauqua county outside the immediate environs of Peru; on the whole it has proven to be a rich field. Immediately south of Peru about three miles is another pool developed during 1905, known as the Scott pool. There are nearly 40 wells along a north-and-south line about two miles long, with dry wells on the east and light gas wells on the west. There seems to be a north-and-south trend of gas territory between this and the Blundell-Spurlock pool.

Production.—The production for the year 1905 is about 12,000,000 bbl. The table given herewith shows the total production by months of the entire area, as bought by the Prairie Oil Gas Company and according to their monthly report; it exhibits the total runs daily; the average of the same; total deliveries to refineries; daily average of same; total put into tanks; daily average of same; and, finally, total stocks on hand at the end of the year and for each month during the year.

To these should be added a small amount consumed by the independent refineries at Humboldt, Paola, Cherryvale, etc.; and the still smaller amount used as fuel and lubricating oils, which may be estimated at from 100,000 to 125,000 bbl.

It will be noticed that, beginning with July, the monthly runs exceeded 1,000,000 bbl.; and that for the last three months it exceeded one and one-third million; so that 1905 turns over the industry to the new year on a basis of more than 16,000,000 bbl. annual production. Of this amount, much more than one-half came from the Indian Territory; but at the present an exact division cannot be made. Presumably, however, not more than one-third of it came from Kansas.

The extra development in the Indian Territory, as already explained, was due in part to stronger wells and less uncertainty in drilling. But another very important factor is the legal status of leases on Indian lands. The Secretary of the Interior requires a certain form of lease, one clause in which specifies that at least one well shall be drilled by the end of the first twelve months after the lease is approved. This has been the most important factor in forcing drilling. The Secretary is of the opinion that he is best serving the cause of the Indian by giving him royalties from oil wells as rapidly as possible. It is generally believed that the low price of oil is due to the great excess of development over consumption. According to the table given, the Prairie Oil Company has 14,000,000 bbl. of oil stocks stored, here and there, throughout the oil-producing territory and at the Sugar Creek refinery near Kansas City, with an increase of nearly 40,000 bbl. per day. With the entire area controlled by one good business head, development would be stopped until the stocks had decreased greatly and the price of oil advanced; but with the Secretary of the Interior insisting on the "development clause," no one cares to jeopardize the title of valuable leases by declining to drill; therefore the price goes downward, and production continues to increase.

Gas.—The production of gas was greatly increased during 1905. Early in the year the Kansas Natural Gas Company began buying property, and has continued that policy to the present. It now owns all the leases formerly owned by almost every big gas company in the State, and stands ready at all times to pay for any new developments that may be made. They now own nearly all the good production of Montgomery and Wilson counties, the two richest gas fields in the mid-continental area. From near Independence south to the State

TABLE SHOWING MONTHLY PIPE LINE RUNS OF THE PRAIRIE OIL AND GAS CO.—MID-CONTINENTAL AREA.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.
Runs.....	793,648.03	564,482.12	695,908.03	549,338.50	784,228.69	715,396.93	1,090,999.86	1,212,912 48	1,203,362.03	1,380.208.19	1,355,011.72
Daily average..	25,601.55	20,160.08	22,448.65	18,311.28	25,297.70	23,846.56	35,193.94	39,126.21	40,112.07	44,522.44	45,167.06
Deliveries.....	315,426.12	292,648.65	249.563.74	241,251.98	219,065.05	185,888.80	206,155.47	279,391.38	318,863.79	209,093.95	416,476.31
Daily average..	10,175.04	10,451.74	8,041.73	8,041.73	7,066.61	6,196.29	6,650.18	9,012.63	10,628.79	6.744.97	13,882.54
Put into tanks..	478,221 91	271,883.47	308,086.52	308,086.52	563,163.64	529,508.13	884,844.39	933,521.10	884,498.24	1,171,114.24	938,535.41
Daily average..	15,426.51	9,708.34	10,269.55	10,269.55	18 231.09	17,650.27	28,543.36	30,113.58	29,483.28	37,777.87	31,284.52
Total stocks....	5,655,672.22	5,912,207.43	6,327,923.47	6,657,926.10	7,256,627.71	7,573,535.71	8,265,004.09	9,213,215.98	10,618,676.23	11,585,178.00	

line, wells with a daily capacity of 15,000,000 cu. ft. are comparatively common, and some producing 30,000,000 are known. One well measured when open (by using the Pitot tube, the mouth of which was placed a little to one side of the center of an 8¼-in. pipe), gave a pressure of 38 lb. on the gauge attached; this is perhaps the largest well in the entire region.

A well drilled in during October near the State line, tested close to 35,000,000 cu. ft. In the Indian Territory some enormous gas wells likewise have been found, a number of which range from 15,000,000 to 20,000,000 cu. ft. The strongest wells are near the line between the Osage and Cherokee lands, some on one side and some on the other. In the vicinity of Bartlesville, gas is found in the sand above the principal oil-sand. Frequently this gas is allowed to escape and the drill sent on down to the oil. In other places gas is in a sandstone corresponding to the oil-sand. Recently a number of strong gas-wells have been drilled two or three miles southeast of Bartlesville. Some of the strongest wells are found west of Ramona; in the vicinity of Pawhusky wells ranging from 8,000,000 to 15,000,000 cu. ft. have been obtained.

The Kansas Natural Gas Company now has its pipe lines laid northward beyond the Kansas river almost to Atchison and St. Joseph, with one branch leading west to Topeka and another line to Kansas City. A large pumping station is established at the little town of Petrolia, on the west side of the Neodho river, about midway between Humboldt and Chanute. Pipes from all over the gas field to the south converge at this point. Two 16-in. pipes are laid, side by side, from the pumping station to Ottawa; here they diverge, one going to Kansas City; the other, north to Lawrence, Leavenworth and Atchison. About three miles south of Lawrence a side line is carried westward to Topeka.

Gas is sold throughout these northern towns at 25c. per thousand for domestic consumption, measured at about 8 oz. above atmospheric pressure. For manufacturing purposes it is offered at lower figures; but up to the present few factories have adopted its use, as gas cannot compete with coal for manufacturing purposes, unless sold considerably below any figures yet offered. All the important gas towns in Kansas and Indian Territory are still offering 3c. gas to manufacturers; some of them in the Indian Territory are offering it at a lower price.

Refineries and Pipe Lines.—The Standard Oil Company has a small refinery at Neodesha with a capacity of about 3,500 bbl. crude per day which has been kept in operation throughout the year at its full capacity. It has built a larger refinery at Sugar Creek, in the eastern suburbs of Kansas City, with a reported capacity of 6,000 bbl. per day, and which began receiving oil early in the year. One 8-in. pipe-line leads to the Sugar Creek refinery from Neodesha, with many laterals ramifying through the entire oilfield to the south. At present, a second 8-in. pipe-line is building to Sugar Creek. Also, an 8-in. line reaches from Sugar Creek to Whiting, Indiana, which was open for operation during the latter part of the year.

Large tank-farms have been established at different places throughout the field and at each refinery, the largest one at present being at Neodesha, with smaller ones at Humboldt, Caney, Bartlesville, Cleveland, Ramona and perhaps other places. Tanks are still building at a rapid rate in order to keep ahead of production.

A number of small independent refineries are located in the State, one at each of the following places: Humboldt, Paola, Cherryvale, Niotaze and Longton. Those at Humboldt and Paola have been in operation the greater part of the year, consuming an aggregate of about 300 bbl. per day. The others have not yet done much refining and are small.

Markets.—Until early in the year 1905 the Prairie Oil and Gas Company made a somewhat arbitrary division of the Kansas oil field for the purpose of establishing prices. In all market quotations previous to this time, Kansas oil was graded as South Neodesha and North Neodesha, with the former bringing regularly 20c. a bbl. more than the latter. The highest price paid in the field was $1.38 for South Neodesha oil early in the year 1904. This quotation lasted but a few days when the price began to drop and gradually declined throughout the year, reaching 72c. in December. The downward tendency continued until it reached the low price of 50c. a barrel for the best Kansas-Indian Territory oil during the first half of 1905, at which point the market rested for months. In the middle autumn, a 2c. advance was made, after which the market was stationary to the end of the year.

Early in the year, the old fashioned way of grading oil into South Neodesha and North Neodesha was abandoned, and a gravity scale was adopted. Under this regulation, oil testing 32° B., or more, was given the top price, and a decrease of 10c. per bbl. for each degree, or 5c. for each half-degree, was put upon the lower grades of oil. Gravity tests were made by the gauger and were strictly enforced, often a shade of one-tenth degree causing a difference of 5c. per barrel.

A portion of the oil from Montgomery county, all the oil from Chautauqua county in Kansas, and practically all from the Indian Territory-Oklahoma field tests 32° B. or more, some of it reaching as high as 37° B. or 38° B. Almost all the remaining Kansas oil tests below 32° B. Although a penalty of 5c. for each half-degree was imposed on oil below 32° B., yet a corresponding increase was not made for that above 32° B., so that wells producing oil testing from 35 deg. B. to 38 deg. B. have never been more profitable than they would have been had their product been barely above 32° B.

Future Developments.—The success attending present operation in the Indian Territory is so great that future development will probably increase over the present production. Should the price of oil start upward with a fair promise of reaching $1 per barrel, almost every lease holder in the oil region would begin drilling. Under such circumstances it is difficult to tell what the result would be. Could we have another year of such prices with a demand for the entire production, it would not be surprising if the field should reach a capacity anywhere from 75,000 to 100,000 bbl. per day.

The Coals of Illinois.

BY S. W. PARR.*

The total output of coal from all mines in Illinois in 1904 (Twenty-third Annual Report, Illinois Bureau of Labor Statistics) was 37,000,000 tons, with a valuation at the mines of over $40,000,000. A conservative estimate for the current year would place the output in excess of 40,000,000 tons. It will thus be seen that Illinois ranks next to Pennsylvania in the tonnage and value of coal output.

There are eight geological seams in the State, which are of commercial importance in the production of coal. The original classification by Dr. Worthen, in the first geological survey, has served for the designation of these seams up to the present time, although uncertainty as to the correctness of the numbering and also as to the continuity of the seams as interpreted for all localities calls for a careful review of the designations now in use, and perhaps the devising of a better system. It is of interest to note in this connection that there is just being inaugurated a new geological survey under the directorship of Dr. H. F. Bain, with headquarters at the University of Illinois.

Using, however, the numerals now in vogue, beginning with the lowest (or in point of geological time the first) and counting upward, the producing seams are the first, second, third, fourth, fifth, sixth, seventh and fourteenth. In point of commercial importance the interest resides almost wholly in seams numbered 1, 2, 5, 6 and 7, the combined output of the seams numbered 3, 4 and 14 amounting to barely 0.1% of the total output of the other five seams.

*Professor of applied chemistry, University of Illinois, Urbana, Ill.

In general it may be said that seam No. 1 supplies about 2% of the output of the State; the working localities are in the extreme northwest border of the coal area, mainly in Mercer county. Seam No. 2, which furnishes approximately 14% of the output, is mined in the extreme northern and northeastern and southwestern borders of the coal area, representative centers being Spring Valley and Braceville in the north, and Murphysboro in the south. Seam No. 5 produces 34% of the output, Sangamon county alone furnishing one-third of this amount, the rest coming mainly from Fulton, Peoria, Menard and Logan counties. It will thus be seen that the mining of the fifth seam is chiefly confined to the northern half of the coal area. The southern half of the area furnishes coal mainly from the sixth vein, 35% of the entire yield of the State coming from this source. Seam No. 7 is mined in the extreme southern part of the State, in Williamson county, and also in the extreme eastern section in Vermilion county, the output from this vein amounting to about 14% of the total.

There is no relation between the number of the seam and the distance from the surface of the deposit. For example the major part of seam No. 1 is worked at a depth of less than 200 ft., though an isolated working of this seam at Assumption is carried on at a depth of 1,000 ft., by far the deepest mine in the State. Somewhat roughly estimated it may be said that, 10% of the output is mined at a depth of less than 100 ft.; 45% is mined at a depth of from 100 to 200 ft.; 20% from 200 to 300 ft.; 15% from 300 to 400 ft.; 5% from 400 to 500 ft.; 5% from 500 to 700 ft.

A comparative study has recently been made of the chemical composition of these various seams to develop any points of difference or similarity that may exist. Ten representative mines were selected for each seam and samples taken from car lots of screened nut or lump, as made ready for the market. The average for each lot of ten was computed with results as shown in Table I.

TABLE I. PROXIMATE ANALYSIS OF AIR-DRY SAMPLES BY GEOLOGICAL SEAMS.

Constituents.	I.	II.	V.	VI.	VII.
Fixed carbon.....	46.16	47.92	42.87	44.72	49.90
Volatile matter....	37.31	37.31	38.96	37.67	36.43
Ash.....	8.97	6.45	9.98	9.01	7.29
Moisture.....	7.56	8.32	8.19	8.60	6.38
Combustible (ash and water free)..	83.47	85.23	81.83	82.39	86.33
Total carbon.....	71.91	72.63	69.39	68.75	73.90
Sulphur.....	2.17	2.28	2.61	2.75	2.22
B.t.u. per pound of coal.....	12,134	12,243	11,851	11,571	12,397

It will be seen from the table that the coals of the State vary within rather narrow limits. In point of total carbon and heat units, seam No. 7 would rank first, being closely followed by seams No. 2 and No. 1. Seams No. 5 and 6, which yield 69% of the total output, come last. It should be noted, however, that the difference between the highest and the lowest is only 7% of the latter. The order given above has been determined by the factors for total carbon and the thermal units. It is interesting to note, however, that the figures for sulphur indicate the same order, with the exception that seams No. 2 and 1 exchange places. Grading the seams by their ash content, No. 2 would be first with No. 7 as second, while No. 5 and 6 would exchange places. But these differences are somewhat finely drawn and may be of scientific rather than practical interest.

There is one phase of the matter that may bear further discussion. Illinois coals are of a type midway between the semi-bituminous coals of the East and the lignitic coals of the Northwest and Southwest. Perhaps the most striking characteristic of each type lies in the composition of the volatile matter. Too little attention has been given to this constituent. A misleading label for it has come into general use, viz.: "volatile combustible," whereas a very considerable percentage is inert and non-combustible. This factor representing the amount of non-burning combustible matter has been worked out for a large number of Illinois coals, and in the case of the averages by seams from Table I, the results are shown in tabular form as follows, as percentage of air-dry coal:

TABLE 2. BY GEOLOGICAL SEAMS.

Constituents.	I.	II.	V.	VI.	VII.
Total volatile matter...	37.31	37.31	38.96	37.67	36.43
Actual combustible volatile matter.....	25.75	24.71	26.52	24.03	24.00
Non-burning volatile matter.....	11.56	12.60	12.44	13.64	12.43
Total actual combustible (fixed carbon + true vol. combus.)....	71.91	72.63	69.39	68.75	73.90
So-called combustible, i. e., ash and water free.....	83.47	85.23	81.83	82.39	86.33
Ash and water.....	16.53	14.77	18.17	17.61	13.67
Ash, water and non-burning volatile.....	28.09	27.37	30.60	31.25	26.10

A comparative summary therefore would be as follows: In semi-bituminous (Pocahontas) coal, one-fourth of the volatile matter is non-combustible; in Illinois coals one-third of the volatile matter is non-combustible; in lignite one-half of the volatile matter is non-combustible.

Even more striking perhaps is the ratio of non-combustible volatile matter when referred to the total coal content: In Pocahontas coal 4% is volatile non-combustible; in Illinois coal, 12%; in lignite, 20 per cent.

Now take the usual practice of the engineer in referring for example the evaporative efficiency of a boiler to the "combustible," *i. e.*, to the "ash and water free" condition, whereas in truth the actual fuel is the "ash and water free" minus also this additional factor from the volatile matter which is non-combustible. In the case of Pocahontas coal the difference is slight and the error small, and although 25% of the volatile matter is non-combustible the entire amount of volatile is only 16% to 20% of the coal, hence the 4% or 5% of error resulting from this method of reckoning is not so great. By the usual method, the engineer would calculate that 105 lb. of Pocahontas coal would make 100 lb. of "combustible" as "ash and water free." As an actual fact, were the calculation based on the material present which burns, it would require more nearly 110 lb. to make 100 lb. of this true combustible. Now, when we consider Illinois coals on this basis, the common calculation would show approximately 120 lb. of coal as containing 100 lb. of "combustible" as "ash and water free," whereas 100 lb. of actual combustible present would require more nearly 140 lb. of coal.

When we come to lignites the difference is still more striking. The common method of calculation would call for 120 lb. to yield 100 lb. of "combustible," whereas, in fact, 160 lb. are needed for each 100 lb. of real fuel. These facts may be more readily shown by means of Table III made up from averages of typical samples.

TABLE 3.

Kind of Coal.	Number of pounds ordinary coal required to make 100 lbs. of "combustible." Common method "ash and water free."	Proposed method ash, water and non-combustible volatile free.	Error of common method in pounds per 100 of actual combustible.
Pocahontas	104.62	109.43	4.81
Illinois	119.00	141.00	22.00
Lignite	120.23	162.49	42.26

These facts suggest a number of questions. In the first place, is it not true that the ordinary boiler test for determining evaporative efficiency has enough guesswork about it already without introducing this evident element of error.

Again, if the rating of a boiler using Pocahontas coal were referred to actual combustible and then the same basis were used when working with a coal of the Illinois type, it would be known at least that the difference in results could not be explained by the fact that the two coals were fed into the furnace under different names. Can there be any scientific basis of comparison where there is no similarity in the initial units?

If the chemist had made this factor for the non-combustible portion of the volatile matter as easily accessible as the factors for ash and water, would the present anomalous practice have become established? On this purely chemical phase of the matter I may have something to say at another time.

The New York Graphite Industry in 1905.

BY D. H. NEWLAND.*

There has been a marked advance in the Adirondack graphite industry during the past year. The output has been larger than ever before, owing to the additional supply from companies who have become active producers for the first time; and unusual interest has been shown in prospecting for new deposits, in some cases leading to promising developments. While productive operations have so far been confined to the region bordering Lake George and southern Lake Champlain, it may be noted that the distribution of graphite is widespread throughout the metamorphosed sediments of the Adirondacks.

The American Graphite Co., a branch of the Joseph Dixon Crucible Co., has continued to work its mine at Graphite, near Hague. The mine is remarkable for its size and the excellence of product. The graphite occurs in the form of flakes distributed through quartzite. The rock is crushed at the mines and concentrated by means of buddles and air jigs to an average of about 70% graphite. The concentrates undergo further treatment in the mill at Ticonderoga; the final products consist of high-grade flake graphite and residue. The flake graphite is used mostly as lubricant, while the residue is mixed with imported graphite and made into crucibles.

The Columbia Graphite Co., has opened a mine near Rock pond in the town of Ticonderoga. In character the deposit is similar to that at Graphite, but it does not average quite as well and the graphite occurs in smaller flakes. Pyrite and pyrrhotite accompany the graphite; they are found both in veins and in granular particles distributed throughout the quartzite. Mica is also present. The company has erected a mill at Rock pond with a capacity of 3,000 lb. of graphite per day. The product is hauled by wagon to Ticonderoga for shipment.

A very large area of graphitic quartzite in the same vicinity is owned by John D. Bly, who is preparing to develop the deposit.

In the western part of the town of Crown Point, The Crown Point Graphite Co., has opened a bed of graphitic limestone, and has a mill under course of erection. It is intended to separate the graphite by dry crushing and passing the product over screens. The separation should offer no particular difficulty as the graphite is loosely held in a soft matrix.

On South bay, near Whitehall, the Adirondack Graphite Co,. and the Champlain Graphite Co., have been active during a part of the year. Extensive beds of quartzose schist are found at this locality. The graphite, owing to its finely divided condition, requires special treatment for its recovery.

Among other occurrences in the Adirondacks that give promise of future importance are those at Johnsville on the Adirondack branch of the Delaware and Hudson Railroad, where the graphite occurs in crystalline limestone. Up to the present, however, they have not been worked on a commercial scale.

*Assistant State Geologist, Albany, N. Y.

Welsh Slate Industry.

Consul Williams, of Cardiff, furnishes the following statements as to the slate industry of Wales (U. S. Consular report No. 2449, Dec. 29, 1905).

The depression in the slate industry which has continued for many months, is becoming severe. Stocks amounting to thousands of tons have accumulated at Port Penrhyn and Port Madoc, and many of the slaters have gone elsewhere to seek steadier employment. The men had been anticipating a reduction of wages, and when the manager of the Penrhyn quarries announced a reduction of 10% in wages no one was surprised. The loss in wages will amount to about $100,000, and will affect fully 4,000 men, or nearly one-third of the slaters in the United Kingdom. The number in the Kingdom in 1904 was 12,265, but the great majority were employed in Carnarvon, Merioneth, and Denbigh shires in North Wales. The town most affected will be Bangor.

The slate output of Wales for 1904 amounted to 427,730 tons, valued at $6,991,072.77. Three-fifths of this output was mined in open quaries in Carnarvonshire, aud nearly two-fifths from mines in Merionethshire. The largest quarries are the Penrhyn, near Bangor. where the reduction has been announced and the Dinorwic, near Carnarvon. The largest slate mine, which had an output of 49,192 tons in 1904, is near Festiniog. Most of the slate finds a market in Great Britian, as the exports amounted to only 29,357 tons, of which 25,181 tons were exported from the port of Carnarvon. The total output of slate in the United Kingdom in 1904 was 563,170 tons. This was an increase over 1903, but it was more than 100,000 ton short of the output in 1898, when the high-water mark was reached. The industry has never recovered from the effect of the strike of several years ago. French slate then entered the British market, and it has retained a hold to this day. This combined competition, with the present depression in the building trade accounts for the dull market for the Welsh slate. The cost of production is, perhaps, another element to be considered, for the French slaters receive lower wages than the Welsh.

Tempering Mortar.

BY J. H. GRANBERY.

Tempering mortar is an art; the humble manipulator of the hoe is entitled to rank as an artisan. Not only manual dexterity, but also the knowledge of the properties of different kinds of mortar, and of the effect of different proportions of the ingredients upon it, are factors which contribute largely to the efficiency of the man with the hoe.

Tests made by C. W. Smith, about two years ago, gave results that are somewhat surprising to the engineer who is accustomed to use no cement mortar that is more than half an hour old. The tests were made upon motar of 1:3 proportions in the usual way; of freshly mixed mortar, and of mortar taken from the same batch, one day later. The old mortar was retempered for the tests; briquets made from it (after the same period of setting), showed results slightly above those given by the freshly-mixed batch. The cement used was a slow-setting Portland, its initial set being reached in about 30 min. Much of the discrepancy from the results which might have been expected was undoubtedly due to the personal equation of the mixer.

Under ordinary circumstances, cement mortar should be made in batches of such size that there will be none left to stand over night, or even over the noon-hour. Most cement mortars will begin to set before the lapse of such an interval. The place for mortar to set is in position in the wall, not on a mixing board.

The foregoing applies to cement mortar; lime mortar is harmed to a less degree and, for some purposes, lime mortar should be allowed to stand for some days. The plaster used for finished walls and ceilings in building work is a good example of this; it is usually allowed to stand for at least 10 days before using, and for some first-class work it is specified that it shall be allowed to stand for three weeks. This is done in order that the hair used in mixtures for this purpose, may thoroughly commingle with, and decompose in, the mortar.

Where cement mortar alone is used, it should be placed in the wall as fast as made and not allowed to stand. Most of the natural cements are quick-setting and require this to a greater extent than the Portlands. Lime-and-cement mixtures may be allowed to stand a short time if properly made; and lime mortars a still longer time, depending, in all but the last case, upon the relative proportion of cement contained. The actual time that may be allowed in any case is largely to be determined by experiment, and can be learned by timing the period between the mixing and the taking of an initial set.

CONTENTS.

Editorials:

Notes 89
The Anaconda Strike 89
Petrography 89
Anthracite Coal Prices 90
Judgment and Justification 90
Production of Gold 91
The De Lamar Copper Refinery, *Professor Pufahl* 73
*A Simple Oil-Burning Equipment, *Courtenay De Kalb* 74
*The Ball & Norton Magnetic Separator 75
Cyanidation During 1905, *Chas. H. Fulton* 76
The Electric Furnace for the Manufacture of Phosphorus 78
*The Star-Silversmith Case..... 79
Prices of Rare-Earth Ores, *Chas. S. Palmer* 79
Uranium Minerals 79
The Transvaal....*W. Fischer Wilkinson* 80
*Recent Copper Smelting at Lake Superior .....*L. S. Austin* 83
Magnetic Alloys 84
Oil and Gas Development in the Mid-Continental Field in 1905, *Erasmus Haworth* 84
The Coals of Illinois.....*S. W. Parr* 86
The New York Graphite Industry in 1905.....*D. H. Newland*..... 88
Welsh Slate Industry 88
Tempering Mortar .....*J. H. Granbery* 88
The London Metal Market:
The Copper Market 93
The Lead Market 94
The Tin Market 95
The Spelter Market 97
Preparation of Nickel Sulphate 98
A Notable Semi-Centennial 99
The Coal Industry in Washington in 1905....*C. F. Owen* 99
Metallics 92
Colliery Notes 93
New Publications 98
Professional Papers 98
Questions and Answers 98
Patents Relating to Mining and Metallurgy 100
Personals and Obituaries 101
Industrial News 102
Construction Notes 103
General Mining News 103
Coal Markets 113
Iron Markets 115
Metal Markets 117
Mining Stocks 119
News and Markets 101-120

*Illustrated.

In the navigation season of 1905 the three locks at the Sault St. Marie passed an average of 87 vessels per day. This record has never been approached by any other ship canal in the world.

Notwithstanding the anxiety publicly expressed with regard to its coal supplies for the future, Great Britain continues to be the chief coal exporter of the world. From 35 to 40% of the coal mined in the United Kingdom is consumed beyond its borders.

The United States exports only about 2% of the coal mined in the country; and about half of this is offset by the imports. The coal exports are nearly all to neighboring countries, while the imports are received on the Pacific Coast.

There is no country in the world where the use of crude petroleum as fuel has made such rapid progress as in California. The use of oil-fuel is more extended there than even in Southern Russia. The reason, of course, is found in the scarcity and high price of coal in that State.

THE SUCCESSFUL concentration of the chalcopyrite finely disseminated in monzonite (porphyry) in some of the mines of Bingham, Utah, is one of the metallurgical achievements of 1905. This ore carries scarcely 2 per cent. of copper, which can only be freed by fine crushing. A few years ago the ore was regarded as worthless; now, great expectations are based upon it. Plans are in preparation for several dressing works of huge capacity to concentrate this ore. The exploitation of these mines will afford remarkable examples of the recent progress in both mining and milling methods.

The Anaconda Strike.

The recent strike of rich ore reported in the 2,200-ft. level of the Anaconda has been the subject of much speculation. The fact that rich ore has been found there, is indeed very promising, but large orebodies are not developed in a day or a week, and the mere cross-cutting of an orebody does not show either its length or its height, which can be determined only by drifting and raising on the vein. This work is now in progress. Whether it will disclose a bonanza, or only a small orebody, remains to be seen. The facts that the discovery has been made at a considerable depth below the upper workings, that the ore is rich, and that it is probably the continuation of ore opened in the upper levels are certainly encouraging to the hope that important new reserves will be added to the mine; but until more has been done toward the development of the new strike, its real value will be uncertain.

Copper Mining in California.

Although Shasta county has been for several years credited with the largest mineral output of any county of California —mainly on account of its extensive copper properties—yet there seems to be part of its population which tries to do everything possible to hinder the large companies operating in the county. The numerous suits against the Mountain Copper Company of Keswick, for alleged damages from smelter fumes, caused that company finally to build a new smelter on the shores of San Francisco bay, and take much of its very extensive business out of the county, even the headquarters of the company being removed. And now when the Balaklala Copper Company decides upon a location for its new smelter in Section 20, between Kennett and Copley, a lot of people under the leadership of a lawyer "jump" the locations where the smelter was to be.

The ground had been located on November 5th by the Balaklala interests, but it was under an Indian allotment up to November 3rd and was thrown open November 20th, the jumper's locations being made November 23rd. These people claim that the company's locations on November 5th were before the land was thrown open to entry and therefore void. Two quarter sections are involved.

Against the same company an injunction suit has been filed to restrain it from occupying or developing certain valuable claims. The Balaklala company is working its mines and is about to erect a smelter but is being hindered in its proceedings by the difficulties above referred to. Such conditions are not at all calculated to give Shasta county a first-class reputation among those desiring to invest in mining enterprises within its limits. There is a common tendency to consider it good business to "hold up" the big companies, but it is a short-sighted policy to block enterprises which promote the welfare of a whole district, and the spirit of it should be discountenanced, even if the individual cannot be.

Petrography.

The microscopic study of rocks was first developed by the learned English dilettante, Sorby, who passed it on to Zirkel, and he in turn to Rosenbusch, of Heidelberg, the recognized dean of petrography. That was more than a generation ago, and yet the systematic study of massive, eruptive and non-fossiliferous rocks came in so late that few of the older mining engineers can claim a careful grounding in the science.

At the same time, thanks to our Geological Survey reports and the efforts of many practical specialists, the more prominent of the rock members are popularly understood even in their microscopic relations. The basis of all this is the old Rosenbusch classification on the two coordinates, one of degree of crystallization, and the other on the decreasing acidity or silica content; this is, of course, modified by subdivisions depending on the kind

of feldspar (orthoclase or plagioclase) on the presence or absence of quartz, olivine and other minerals. This was not perfect, but it was simple, flexible and fairly comprehensive.

It was only natural that the science should grow with the advancing spirit of research; it was natural that new additions should be built on to the old framework. All that was sufficiently technical to test the temper and common sense of practical men in application to mining geology. But when, some two years ago, there appeared an ambitious remodeling of the whole system of rock naming and classification in a dialect which seemed a stilted and academic petrographic *Volapük* —then the practical men halted and asked what it was all about.

Far be it from our province to cast discredit on any of the systems of laboratory nomenclature and research. Progress often assumes a strange novelty of habit and disguise; but, with all respect to our learned students we ask, Is it not premature to introduce such cumbrous technology into a profession which must always stick to plain English?

The old system will survive because of its simplicity. Morever, the problems attacked by the new system are really only formulated—not answered. When the final shaping of theory and fact shall appear, then we shall have much more information than we now possess; but, at all events our rock names should always be such that they can accompany the mining engineer in his vest pocket.

Anthracite Coal Prices.

A statement presented by David Wilcox, president of the Delaware & Hudson Company, gives the cost of mining and preparing coal and the average price attained for 1890, as compared with figures for recent years. The costs given do not include transportation; but only mining and preparation for market. The year 1902 is omitted, as the strike disarranged all prices and mining costs. The table is as follows:

	Cost.	Return.	Balance.
1890	$1.2445	$3.3817	$2.1372
1900	1.4049	3.1117	1.7068
1901	1.5430	3.5707	2.0230
1903	1.9564	4.1020	2.0456
1904	1.9675	4.0482	2.0807
1905 (10 months)	1.9113	3.9259	2.0146

As compared with 1890, the cost of coal shows an increase in 1905, of 66.68c. per ton, or 53.6%. The average receipt per ton increased 54.42c., or 17.5%. The balance(from which costs of transportation and selling have to be paid) decreased 12.26c. per ton, or 5.7%. The most noteworthy point in the table is the increase of 41.34c, or 26.8%, from 1900 to 1903; this large advance being presumably due to the conditions imposed by the award of the Anthracite Strike Commission. In fairness, however, some part of it should be charged to the general advance in the cost of supplies, tools, and machinery used in mining, which has been considerable.

The returns given in the table are presumably the amount which the company receives for its coal, as shown by its earnings. The average price of the larger or prepared sizes of anthracite at New York harbor, which is taken as the basis of prices at tidewater, was $4.87½ per ton in 1905. The small or steam sizes, however, are sold at lower prices, which would reduce the average return. The paper is intended to show that the prices of anthracite coal have not been unreasonably increased. On this point Mr. Wilcox has, on the showing of the figures, the best of the argument. The point which he does not touch, and which is always open to controversy, is whether the transportation charge is not too high. So far as mining expenses are concerned, his case is well made out.

One other point in the argument which Mr. Wilcox presents is not so strong. He says that the proportion of small coal increased from about 10% in 1890 to over 35% in 1905. This coal is sold in competition with bituminous, and therefore brings low prices. This brings down the average price received for all coal. All this is true, but Mr. Wilcox fails to note the fact that the small coal marketed does not reduce the quantity of large coal. In 1890 a large part of this small coal, and in earlier years all of it, was considered as waste, and went into the culm piles. Whatever is now saved is an addition to the marketable coal saved, and in any comparison of prices between this year and the earlier years of the trade, what is received for it must be considered as a clear gain, less only the direct cost of handling and transportation. In other words, the small coal is an addition to the income of the operators, not a deduction.

Judgment and Justification.

Many plants—not all of them are metallurgical establishments by any means—are built upon a principle the contrary of that followed by the man who cut off his dog's tail, "an inch at a time, so as not to hurt him." The most unheard of expedients are sometimes required to provide for small additions to works of this class, and these often run into so much money that the plant itself is harmed by the improperly designed work.

It is, perhaps, a question whether it is always practicable to design theoretically work for some of the purposes it is to fulfil. An instance of this is a zinc house, built to provide storage room for the plates used in desilverizing lead in the Parkes process. The particular case required that plates, each 9 by 16 in., weighing 55 lb., be stacked up until they were 70 high. This gave an actual live load of 3,750 lb. per sq. ft. of floor; and the largest beams that could be used to clear the material on the lower floor were only good for 2,200 lb. per sq. ft. at the usual permissible flange strain of 16,000 lb.

These beams were used, and are today (we believe) still in service; the uniform nature of the loading, its quiescence and its addition in such small increments, justified the use of flange strains approaching the elastic limit of the material much more closely than is usual or advisable, in any but isolated cases.

The circumstance alluded to affords an excellent instance of the value, not only of experience, but of judgment. The purpose for which a proposed structure is intended to be used must have due consideration in the design; in some manufacturing processes a slight change in the ordinary routine may result in overloading portions of the structure that are not adapted to bear heavy loads, and disastrous results may ensue.

It is useless to attempt to render the structure "fool-proof"; fool-proof engineering is not *engineering;* the engineer himself is no fool, and he will not ordinarily build for loads which are far in excess of what may reasonably be expected as a maximum. Neither will he hesitate, where the loads are of such character as will allow it, to use higher permissible strains than would in other cases be advisable, or even safe. His judgment, the probability of higher or lower loads be-

ing brought to bear than those for which the structure is designed, and the possibility of such loads being applied, are the factors which determine and which justify the apparent recklessness which may oftimes be wisdom under another name.

Certainly, no engineer of mature experience or sound judgment would attempt to build a structure that would be literally fool-proof; that is, that would stand up against any possible combination of circumstances. It is sufficient that it will accomplish, economically, the purpose for which designed, and that it will allow of a reasonable deviation from such a purpose without becoming endangered.

The Production of Gold.

A correspondent has sent us the following letter:

"It has been asserted by economists of standing that the very large increase in the production of gold of the last few years has so greatly enhanced commodity prices as to make probable an increase in the cost of producing gold, which latter fact will, in turn, tend to restrict or check the production of gold. In other words, the higher cost of materials, supplies, labor, etc., used in the production of gold, is now becoming so heavy as to make the working of low grade ores, or comparatively light-yielding mines, unprofitable. If this is the case, the tremendous importance of it as bearing upon a continuation of the present level of commodity prices, and of our existing 'prosperity,' is quite evident. It would be very desirable to know whether the cost of producing gold during, say, the last five years, has increased or decreased. To what extent have improvements in mining machinery and other economies in extracting gold from its ores, been an offset to the increased cost of materials and labor?"

Increase in the cost of mining, through advanced cost for labor and materials, would naturally have some effect upon the production of the metal, if the increased unit values were not offset by decreased quantities required. The production of gold, however, is more directly affected by lucky discoveries of new and rich deposits, or the consummation of some new, more economical method of ore treatment than it is by moderate changes in the cost of handling a ton of material. For example, the output of gold during the last five years has been enormously increased by the working of the placers in Alaska and the Yukon. These placers have been operated successfully, on an increasing scale, although the cost is greatly in excess of that at which similar work is performed in more accessible parts of the world. About 12 years ago the gold production of the United States began to be largely increased by the discovery of an entirely new district at Cripple Creek, Colorado, which proved to contain a group of very important mines. Another instance of the striking causes which have contributed to the recent increase in the gold production of the world was the successful development of the cyanide process, which was firmly established about 10 years ago, and at the present time furnishes approximately 20% of the entire gold production of the world, and indirectly considerably more, because of the additional yield by stamp-mill amalgamation from mines which without the cyanide process could not be operated profitably by stamp-mill amalgamation alone.

It is extremely difficult to determine the relative cost of mining over a period of years, because the cost is usually dependent upon a great variety of conditions other than the mere cost of handling a ton of material, which is the only reliable unit for comparison. For example, the development work required may be a good deal more in one year than in another; a reduction in the average width of the vein worked may greatly increase the cost of production per ton of ore, although the cost of mining per ton of material, including the ore and the barren rock that must be broken out with it, may be reduced. A single class of mines, only, affords any indication as to the actual results. This is the class of mines, like those of Treadwell Island, Alaska, the Mercur in Utah, and the Homestake mine in the Black Hills, which have very large deposits of uniform ore; in which the developments are practically always in ore; and in which there is only a small percentage of barren rock to be culled out. The official reports of these mines show different conditions. In the Alaska-Treadwell, the cost of mining and milling increased from 91c. per ton in 1900, to $1.33 per ton in 1904. In the Alaska-Mexican the cost of mining and milling in 1900 was $1.64 per ton; in 1901, $1.71 per ton; in 1902, $1.60 per ton; in 1903, $1.80 per ton; in 1904, $1.79 per ton. The Ready Bullion mine of the Alaska United company, on the other hand, shows a decrease in cost since 1901. At the Homestake mine, the cost of mining and milling was $3.16 per ton in 1900; $3.31 per ton in 1902; $2.82 per ton in 1903; $2.63 per ton in 1904. The cost of mining at Mercur was $1.41 per ton in 1902; $1.30 in 1903. These figures indicate the variety which is shown in the reports of various gold mining companies.

The reports of other kinds of mines show similar variations; in some cases an increase in cost; but in other cases, which appear to be decidedly the majority, a decrease. Three or four years ago the cost of mining in the great sulphide orebodies of Leadville was about $2 per ton in the best managed properties; now it is only $1.50. In 1902 the cost to the Bunker Hill & Sullivan company (Coeur d' Alene) was $2.09 per ton; in 1903 it was only $1.63. On the other hand, the cost of mining in Southeastern Missouri has increased. These mines, although not gold mines, afford excellent data upon the cost of mining; the same influences which affect them (in so far as the extraction of material is concerned) also affect the gold mines.

We think that in general there is no question that although the cost of labor and material has increased, and in some cases the cost of mining and ore treatment has increased in approximately the same ratio, in more cases the cost of mining and treatment has decreased because of the economies that have been introduced through improved methods. This is shown broadly by the ability to work lower and lower grades of ore in many important mining districts; it is shown by the continued increase in the production of gold by the cyanide process, which is enabling the profitable treatment of ores that previously could not be worked to advantage; by the increased production of gold from the dredges, which are of comparatively recent introduction; by the greatly increased production of the precious metals as by-products of lead and copper ores, of which the cost of smelting and refining has been remarkably reduced during the last 10 years. The very fact that the gold production of the world has been during the last 10 years increasing at such a great ratio without any check whatever (save the war in the Transvaal) is the best evidence that there are no causes in operation which will tend to restrict the production. Mr. Wilkinson's article on gold mining in the Transvaal in 1905, printed elsewhere in this issue, may be profitably read in this connection.

Metallics.

The electrical conductivity of hard-drawn silicon-copper wire is 9.3% of that of hard-drawn copper wire. The silicon lowers the conductivity to a great extent.

In sampling orebodies in a mine, errors arise most frequently because the samples are not taken with sufficient care, or at sufficiently close intervals, or by the right method.

Mr. J. H. Collins defines slime as that material which will remain suspended in clear water for a perceptible time, or will not sink in it at a greater rate than say, 1 in. in 10 sec., and is not perceptibly gritty when rubbed between the fingers.

In many cases the only way to arrive at the correct idea of the true average width of pay ore in a vein is to multiply the tonnage of pay ore extracted from the stopes by the average number of cubic feet per ton of ore, and divide this by the area of the stopes from which it was obtained.

More time is sometimes used in grinding the tool than in cutting metal. This is due to the extreme hardness of the material that is being machined. A high-speed tool cuts both hard and soft material indifferently, and if properly treated is as little affected by one as by the other.

In the preparation of sheet mica, one person can clean and thumb-trim from 35 to 45 lb. of medium-sized sheets in 10 hours. Each size is by means of a hand-press, pressed firmly into a barrel, generally a sugar barrel, holding about 325 lb. The packed mica is then shipped to the trimming works.

Fusing with bisulphate of potash or borax and then boiling in water and polishing with sand is recommended by Gmelin, for cleaning platinum ware. When it is desired to clean the outer surface of dishes in this manner, they must be placed in larger dishes of sufficient size to allow the fused flux to completely envelope the article to be cleaned.

Weight for weight, silicon probably hardens copper more rapidly than any other element; and for this reason it is quite probable that silicon-copper spring metal may eventually become one of the standard mixtures for brass rolling-mill work. Aluminum bronze is an alloy which is unfit for the manufacture of spring metal.

In the preparation of ore samples for assay at the large smelters, the pulp is pulverized to pass a 120-mesh screen. On some ores, 80-to 100-mesh grinding is sufficient, but on many ores pulp ground to that size will show too large variations in check assays, and it is safer to put everything through a 120-mesh screen. Some assayers advocate the use of a 150-mesh screen.

A beautiful finish on aluminum castings can be obtained by casting under proper conditions, in the right kind of mold, but it is very difficult to polish aluminum which has been machined. The only thing to do is to use a high speed buffing wheel of cloth, felt, or leather, and to polish the metal just as in the case of silver, using fine emery, rottenstone, pumice or whiting.

It is desirable, in computing the assay value of a mine, when circumstances permit, to reduce all computations to a standard of width, or stoping value, coinciding as nearly as possible with the approximate average width of the vein, so far as it can be ascertained from developments, or in the case of narrow veins, based upon the stoping width it is necessary to open in order to extract the ore.

A comparatively slight strain or wrench is sufficient to thrown the seats of a gate valve out of line, and in screwing a valve on a pipe, applying the wrench to the end farthest from the pipe will sometimes tend to distort the seat, and so cause a leak, as also will screwing too long a length of pipe into a valve without proper support to prevent it from bearing or springing down on such a length after it is screwed into the valve.

Puzzolan cement made from slag is characterized physically by its light lilac color, the absence of grit attending fine grinding, and the expreme subdivision of its slaked lime element; its low specific gravity (2.6 to 2.8) compared with Portland (3 to 3.5); and by the intense bluish-green color in the fresh fracture after long submersion in water, due to the presence of sulphides; this color fades after exposure to dry air.

At the Great Falls works of the Boston & Montana Company, the concentrator has automatic feeding arrangements at the crushers, with sorting belts. From these belts the ore of smelting grade is picked off and sent directly to the blast furnaces and losses in treatment are thereby reduced. No extra labor is required for this work, as the man who formerly fed the crusher now does the sorting, and the efficiency of the whole mill is better on an automatic and regular feed.

In computing the value of an orebody of uniform width and 100 ft. length, consisting of 10 ft. of $20 ore and 90 ft. of $10 ore, if five samples were taken at equal distances, only one at most could fall in the $20 area, and the mean assay value would then figure out $11.25, or only slightly above the truth. If five samples were taken at unequal distances, two or more might fall in the $20 area, and the mean assay value would come out much too high, unless allowance were made for the greater distances between the $10 samples.

The converters at Great Falls are of the 'upright' type. The diameter of the bowl is 7 ft. The average duty of one lining is 15 tons of copper. A larger converter, of elliptical cross section of bowl, has been built (longer diameter 10 ft., shorter 9 ft.) and so lined that when filled with matte to a depth of 16 in. above the tuyeres, it will hold twice as much matte as the original converters for the initial charge. It is expected that enough lining material can be placed in this bowl to provide for a duty of 30 tons and that the time required to blow this amount of copper will be no greater than with 15 tons in the old converters.

Phosphor-tin occurs in commerce principally in two forms: The 3% and the 5% phosphor-tin. The two may readily be distinguished by the fracture. The 3% phosphor-tin breaks easily and the fracture is scale-like. The scales are not large, but are glistening and crystalline. The 5% phosphor-tin is brittle, but the fracture resembles a very coarse-grained spelter. The crystals are long and fibrous and very bright and glistening. As far as the color is concerned, both the 3% and the 5% are identical, and the only method by which they can be distinguished, outside of a chemical analysis, is by examining the fracture. The 5% phosphor-tin is the most generally sold.

According to A. R. Weigall, in a recent paper read before the Institution of Mining and Metallurgy, gold mining in Japan is still in an embryo state. The gold resources of that empire are but little known, owing to the small amount and superficial character of the developments that have so far been carried on. With firm and tactful management, and a foreman having some knowledge of the customs, prejudices, and language of the people, the Japanese miner is the best laborer at his price in the world. Compared with the Chinese miner, one of the chief points of difference is that, while the Chinese has too little initiative, the Japanese has too much, and invariably attempts to carry out the work in what he considers the proper way, regardless of instructions.

Settlers have been installed at the reverberatory furnaces, at Great Falls, Mont., of the same form and with the same lining as those used at the blast furnaces, viz., 16 ft. outside diameter, 13 ft. inside and 60 in. deep. The furnaces, with hearths 42.5 ft. by 15 ft. 9 in., discharge slag and matte into these settlers, and the losses of copper in slag are less than when the furnaces were skimmed. By the use of an automatic and continuous feed of calcines and discharge of slag, the time formerly required for charging and skimming is cut off, and the daily furnace capacity is thus increased. In the use of gas in reverberatory smelting, the Great Falls plant differs from all the other copper works of the West. The coal supplies come from Sands Coulee and Belt and is of such a quality that direct firing would not be satisfactory.

Colliery Notes.

L'Eclairage Electrique reports of the effect of the heat from a 100 volt 16 c.p. incandescent lamp on heaps of carbon dust. Within three minutes from the first contact smoke was evolved, and 25 minutes was sufficient to start combustion. Danger is shown in the practice of leaving open lamps even for a short time in close proximity to coal dust or small coal. Danger is enchanced by the fact that spontaneous combustion may occur after the removal of the lamp, when fear of further trouble may have been allayed; disastrous consequences are apt to ensue; and too strict a supervision cannot be kept over the manner in which hand lamps are employed in collieries. Hand lamps with a wire guard do not go far enough; they cannot be regarded as insurance against accident, for there is nothing to prevent the use of the lamp when they are removed.

The operator of every coal mine in the State of Illinois is required to make, or have made, an accurate map or plan of such mine, drawn to a scale of not less than 200 ft. to the in., on which must be given the following information: The county and township in which the mine is located, the designation of the mine, the name of the operator or owner, the certificate of the mining engineer or surveyor as to the accuracy and date of the survey, the direction of the meridian and the scale to which the drawing is made.

A machine designed to take the place of explosives is being tested by a mining company in Canada. It is a hydraulic cartridge, said to have been used with success in England. In the use of the new device, when the undercutting is completed, a hole of about 3 in. diam. is bored in the coal parallel with the roof, and the cartridge is inserted. A piston operates at one end and a pump at the other. The pump forces the water along a tube until it comes in contact with the first piston and pushes it out. The pressure becomes general on all pistons, which commence to penetrate the coal in a downward direction. These pistons are close together, there being hardly a half an inch between them. As the pressure increases, the coal gradually leaves the roof and falls to the floor in good condition to be placed on the market. It is not broken so much into dust and slack, as is the case when powder is used in blowing it down. The apparatus is not heavy, it weighs only 40 lb., and one man can operate it. The quantity of water necessary varies from a pint to a quart, according to the pressure required to bring down the coal. This water is stored in a little reservoir attached to a pipe, and runs to the bottom of the pump.

The mine manager or superintendent should have special attention given to the condition of the hoisting ropes, and before the men are lowered in the morning the soundness of the ropes should be tested by hoisting the cages. The cages, safety catches, pumps, sumps and stables should also be examined frequently. In some States the mine is examined every morning by the mine examiner before the men are allowed to go to work.

The mining laws of Illinois require that in all coal mines in the State, where coal is blasted, the quantity of powder used in the preparation of shots shall not in any case exceed 60 in. in coal seams 5½ ft. and over; and shall not exceed 48 in. in coal seams under 5½ ft. in thickness. For the purpose of determining the quantity of powder to be used in the preparation of any given shot, an inch of powder is taken as one lineal inch, measured in a metallic charger not more than 12 in. in length and 1½ in. in diameter. It is illegal for any person to drill or shoot what is known as a "dead" hole for any part of its depth, or to tamp any drill hole with drill dust, or other combustible material.

Not more than one shot should be ignited at the same time in any one working place, unless the firing is done by electricity or by fuses of such length that neither of the shots will explode in less than three minutes from the time it is lighted. When successive shots are to be fired in any working place in which the roof is broken or faulty, the smoke should be allowed to clear away and the roof examined and made secure between shots.

Irrespective of whether coal mining is done by shafts or inclines, the depth must necessarily add to the cost of working. The only way to counteract such increased cost is by an increased output, over which the general expenses can be distributed. The main increase of expense is in the cost of hoisting, but extra timbering of the roads, and the arching of the roadways also add to the cost. A good deal of the extra expense of maintenance of roads can be met, however, by a careful laying out of the workings, and by not having the levels in solid coal, but in the middle of the gob-road with packing on each side.

A separate map, drawn to the same scale in all cases, should be made of all coal seams, showing all shafts, inclined planes, or other passageways. This method, if the maps are made upon tracing paper or cloth, permits the abutting portions of each to be placed in juxtaposition, and facilitates the draftsman's work, as well as adding to its accuracy.

Blasting powder and explosives for collieries should be stored in a fire-proof building on the surface, located at a safe distance from all other buildings, and not in any part of the mine.

The London Metal Market.

We give below the reports of our special correspondents, receipt of which was delayed by stormy weather on the Atlantic:

THE COPPER MARKET.

The year opened with a very hopeful outlook for copper, as indeed for all metals. Industrial expansion was everywhere manifest, and particularly in the United States; and the present summary will show that the hopeful anticipations were abundantly justified in the sequel. There was an early run upon refined sorts, particularly for European continental consumption. Available supplies being quickly absorbed, operators turned their attention to the standard market, wherein three months' warrants had advanced recently and now stood at £68 15s. The home trade quickly responded, and produced general activity. Toward the middle of the month considerable speculative business developed, and a further advance was checked by realization of profits as well as by bear sales. On the other hand, a large business was in progress for export to the Far East, while the shipbuilding and engineering branches gave promise of increased activity, and American producers were firm, while the reports concerning American consumption were uniformly favorable. Fluctuations in the standard prices were comparatively unimportant; and the closing prices were £67 15s. to £67 17s. 6d. for cash, and £67 17s. 6d. to £68 for three months.

February found the speculative element rather subdued by political uncertainties; but the consuming industries continued to absorb good quantities, and producers found a ready market for all they had to offer. Thus the standard market was depressed during the early part of the month, although the turnover was large; but an improvement was soon apparent, prompted largely by requirements for railway material at home as well as by a revived inquiry from India for manufactured sorts and from China for large quantities of copper. Sulphate of copper too was in improved request, and the reports of American trade were too significant to allow pessimism to prevail. Accordingly, about the middle of the month, a marked improvement set in, and cash standard rose steadily from £67 7s. 6d. to £68 6s. 3d. at which the month closed; three months' being £68 15s.

March opened with an increased volume of trade in all branches of industry, and with consumers barely supplied, while the American trade reports all indicated immense requirements. The shipments of copper to China—actual and prospective—were steadily increasing. In curious contrast to this activity in refined sorts, the standard market was depressed by bear sales which brought the price down to £67 17s. 6d. for cash, and £68 5s. for three months. A temporary set-back in the American price for Lake Superior

brands served to stimulate the bear attacks. The month was still young, however, when the inevitable rally caused a hasty covering of bear sales and a sharp advance to £68 15s. for cash, and £69 2s. 6d. for three months. Thereafter some uneasiness prevailed in financial circles, caused by the internal troubles in Russia, and in spite of the general activity in consumption of the metal, speculation inclined to the fall, and the month closed with prices depressed down to £67 7s. 6d. and £67 15s. respectively.

April found the downward movement persistent in standard transactions, the first week bringing prices down to £66 17s. 6d. and £67 5s. respectively, but these were of short duration. The industrial activity in the United States—particularly in iron and steel—was too significant to be ignored, while the curtailment of shipments of American copper to Europe, the persistent demand from China, and the renewed buying for home consumption, caused a depletion of stocks which lifted values—by the middle of the month—to £67 5s. for cash standard, and £67 12s. 6d. for three months. Then followed a relapse, caused primarily by a heavy decline in Rio Tinto shares; bears became increasingly aggressive, until the depression in the London market brought forth reduced quotations for Lake Superior brands. Other refined sorts were well maintained; so that the margin between standard and refined was abnormally wide Trade prospects continued excellent, and there was a notable improvement in demand for sulphate, but consumers for the most part stood aloof and allowed the downward movement to develop. The result was that the month closed with cash standard at £65 17s. 6d. and three months' at £65 18s. 9d.

May opened with further depression, due to a collapse in the New York stock market, from which quarter the copper market was influenced more than by the actual condition of trade. Prices fell accordingly to £64 16s. 3d. for cash warrants, and to £64 17s. 6d. for three months'. This was the starting point for an improvement which—with occasional checks—lasted for the rest of the month; the adverse influence of the stock markets being counteracted by the improved demand from consumers whose requirements would brook no delay. There was a marked diminution in the visible supply, largely due to the exceptional requirements for China. American advices continued to be reassuring in regard to consumption, and sulphate was in increased demand for delivery extending into 1906. The month closed rather quietly, after immediate requirements had been satisfied, and with increased confidence in the future. The closing prices for standard were £65 2s. 6d. for cash, and £65 5s. for three months.

June opened with improved prospects. The Japanese victory over the Russian fleet served to dissipate the prolonged suspense which had prevailed, and gave hope of an early restoration of peace. The stock markets improved accordingly, and the improvement was quickly reflected on the metal markets. Bears hastened to cover their commitments, and had to pay advancing prices up to £66 5s. for three months' warrants. This was followed by a reaction prompted by unfavorable news of the New York stock market, causing a temporary fall of about £1 per ton. Further retrogression was arrested by the urgent demand for refined copper and a revival of Indian demand for manufactured sorts. By the middle of the month the trade with consumers had developed largely, notwithstanding the apathy of speculators, and standard stood at £66 for all positions. Toward the close of the month it became increasingly evident that consumption was quite abreast of production and threatening to outrun it, and the possibility of a shortage of supply—particularly in the higher grade metal—was freely discussed. Standard, however, was comparatively neglected and was governed more by the shifting influences of the Stock Exchange than by the operations of trade. It closed at £65 15s. to £65 17s. 6d. for all positions.

July was comparatively uneventful until about the third week, when the signs of expanding trade were manifest on all sides, and it was known that the leading producers had disposed of their entire prospective output for the third quarter of the year. The electrical industry had for some time past played an important part in this development, and was now known to have grown to phenomenal proportions. The home trade continued brisk, the demand from India was steady, as also was that from China—chiefly for coinage copper. Manufacturers bought refined sorts boldly, and advanced their own selling prices; and American prices were persistently advancing. Under these conditions standard could but follow, and bears hastened to cover, with the result that prices rose rapidly to £68 7s. 6d. for cash, and £68 12s. 6d. for three months.

August found the improved conditions fully established, and prices at a level which had not been seen since 1901. The improvement was obviously due to the exigencies of trade and not to any extraneous manipulation. The American prices were repeatedly raised, and purchases extended largely up to the end of the year, leaving but little refined copper available for early delivery. Large quantities of Chile bars and other sorts were withdrawn from public warehouses, and before the month was half over spot copper commanded a premium. Trade continued as good as ever, and it required nothing sensational to promote the rapid advance in prices which prevailed almost to the end, when as much as £72 10s. was paid for standard deliverable in September. At this point, however, some uneasiness was caused by persistent reports of large accumulations in speculators' hands. The origin of these reports was known to be untrustworthy; but the apprehension was nevertheless widespread, and resulted in forced realizations. Speculation apart, the business in refined sorts was exceedingly active, with little or no abatement in price; and consumers were in many cases hard put to it to find an adequate supply of the particular grades required. Thus the month closed with standard at £70 12s. 6d. for cash, and £70 7s. 6d. for forward delivery.

September opened under the shadow of the persistent rumors which had depressed the market in the concluding days of August. English consumers, not knowing what value to place on prognostications so publicly and positively proclaimed, withdrew their support from the market. Bears were alert to take advantage of the situation and to initiate a general attack upon the market. Holders became alarmed, and in many cases followed the lead of the bears; and prices within a few days fell over £5 per ton. This episode will long be remembered as the fruit of a baseless rumor unscrupulously started and circulated for ulterior ends. The result was a large bear account destined to involve many of its victims in heavy loss, as the sequel showed. Meanwhile the legitimate trade remained healthy and promising, and the remainder of the month saw an irregular but irresistible improvement, from £67 15s. on September 7, to £70 7s. 6d. on September 30; cash warrants commanding 15s. more.

October opened with confidence generally restored, further shrinkage in the actual stocks of standard copper, and a rapid advance to £71 15s. for spot warrants, prompted by large bear coverings. The declaration of peace, after the long and costly Russo-Japanese war, was an additional incentive to the already enormous trade. During the first half of the month investors found more attraction in copper shares than in the metal itself, and the standard market was somewhat neglected in consequence. This prompted some renewed activity on the part of the bears, by whom price of three months' standard was forced down to £69 17s. 6d. on October 12. But later in the month it became evident that the depletion of stocks was too persistent, and the scarcity of spot warrants too acute, to justify the heavily oversold condition of the standard market; and prices advanced to £72 15s. for October dates. Some weakness in the stock markets prompted bears to depress prices again, but with only transient success. A fresh attack, launched by the notorious Boston operator, passed almost unheeded; nor have his subsequent utterances inspired more than mild derision. Meanwhile trade was fully employed in all branches, and makers of sulphate had to make considerable inroads on the available supply of Chile bars.

Producers were sold well ahead, and were consequently unwilling to make any concessions in price of refined sorts. Toward the end of the month the internal troubles in Russia inspired apprehension in financial circles, speculation dwindled, and the month closed quietly with standard at £71 6s. 3d. for early dates, and £70 10s. for three months.

November showed early signs of underlying strength in the market, in spite of the prevailing apprehensions in the financial world, and bears were not slow to cover their commitments, being obliged to pay advancing prices on almost every transaction. By November 10 the premium on spot warrants had mounted to £2 per ton, soon to be increased to £2 10s. Meanwhile consumers found themselves obliged to throw off all reserve and to cover requirements as best they could; the result being a rapid rise in the price of three months' standard, and a consequent narrowing of the recent wide backwardation. As the month advanced it became evident that the continued activity of the consuming industries, and the gradual but persistent depletion of stocks—all of which had been evident throughout the year—was now producing something approaching a crisis in which holders would command the situation. Prices advanced quickly, and without putting any apparent check on trade in the manufactured article. Bears having paid the penalty of their temerity, the demand for spot warrants was less eager toward the close of the month; and the price, which had advanced from £71 10s. to £78 10s., closed at £77 7s. 6d. with three months' warrants at £77 2s. 6d.

December opened with great and increasing activity, the dearth of the metal having become increasingly apparent. Political uncertainty checked the excitement somewhat in the early days, but this was of short duration, and while caution ruled in the standard market, famine prices were paid for refined sorts. Standard soon followed, and prices rushed up to £81 for near dates, which price was freely paid on December 14. Thereafter the tension abated, as the most pressing requirements were covered; and standard relapsed under unfavorable influence from the Stock Exchange, due chiefly to the grave political news from Russia. Two days saw a fall of nearly £2 in the price of standard for early delivery; but the manifest scarcity of refined sorts kept the standard price from drifting much lower. Toward the close operations were less numerous and prices somewhat irregular, the latest quotations being £78 17s. 6d. for cash warrants, and £78 10s. for three months.

THE TIN MARKET.

The beginning of the year found this market well maintained and well able to resist the attacks of "bear" sellers, whose operations for a fall had been latterly rather aggressive. Stocks on the European continent were very light, compelling consumers to come into this market for their supplies. Stocks in the United States were also light and strongly held; while American operators showed considerable interest in the article. Eastern sellers, however, who had hitherto offered with reluctance, opened the New Year with rather free selling at receding prices. There was a fair response, chiefly for American account, which steadied the market awhile. Toward the middle of January the European bourses were disturbed by the unsettled aspect of Russian affairs: and tin suffered in sympathy with metals generally. Spot warrants, which had opened at about £134, fell now to £131 under pressure of heavy realizations and bear sales, notwithstanding the uniformly favorable indications of the consuming industries. Thereafter fluctuations were moderate, chiefly in the direction of a widening margin between the prompt and forward prices; and the month closed with cash warrants at £132 7s 6d and three months' at £131 2s 6d.

February opened with a fairly brisk market supported mainly by the American demand, and with Eastern prices relatively higher; but before the middle of the month activity subsided and prices drifted downward till £130 7s 6d. was accepted for cash, and £129 10s for three months. A moderate improvement then set in, and there was a gradual shrinkage in the backwardation on forward sales. Continental demand improved, shipments from the East were known to be moderate, and the month closed with a steady trade; cash warrants at £129 17s. 6d., and three months' at £129 12s 6d.

March found the article in favor by reason of improved statistics, and with some indication of advancing prices; but the advance was quickly checked by selling pressure. The market was comparatively uneventful until the second week, when the Dutch Government unexpectedly announced that the quantities of Banka tin to be disposed of by auction during the remainder of the year would be reduced by 1,700 tons. This was due to a diminution of production owing to scarcity of labor. The quantity in question, though not large, was significant when taken in conjunction with the already diminished supply and the constantly increasing consumption. The result was a sharp upward movement in which consumers and speculators alike participated, until at one moment £136 10s. was paid for spot warrants. Then followed a temporary relapse to £135 10s.; but the statistical position was closely studied, and prompted renewed buying at successive advances up to the end of the month, when cash tin stood at £138 10s., and three months' at £134 10s.

April found the upward movement in full vigor, with bears obliged to cover their maturing sales at heavy sacrifices, and consumption showing abundant signs of activity. This persistent advance culminated in £145 paid for early delivery. Forward metal, being less firmly controlled, did not rise above £136 10s. With the liquidation of bear sales, the heavy premium on cash warrants abated, and the middle of the month found the price at £140, with three months' at £135 5s. These figures were found to be rather more inflated than was justified by trade requirements, and business languished until the cash price receded to £138 5s., at which the month closed with a better demand; the three months' price being £134 5s.

May opened with a fair demand for early shipment to America, and with favorable trade reports. Prices fluctuated daily, mostly in decline, until about the middle of the month when cash warrants commanded only £135 5s. Then an improvement set in, prompted by an official announcement that the Banka production for 1904-1905 amounted to only 7,700 tons as compared with 12,438 tons during the previous twelve months. This caused cash tin to rise to £137 10s. and three months' to £136 2s. 6d. Late in the month efforts were made to depress prices in view of the approaching Banka auction, and were so far successful that the cash price fell to £135 15s., and the three months' to £134 12s. 6d. This, however, failed to accomplish its purpose; for the auction price was equivalent to £139: and the result was a quick recovery in the London prices, which closed at £136 5s. for cash, and £135 5s. for three months.'

June, at the opening, was comparatively uneventful, with restricted operations and with unimportant fluctuations. Offerings were well absorbed, chiefly for American account. The season is seldom a very brisk one in the consuming trades; but everything pointed to increased activity in the Autumn. Statistics continued favorable for a prospective rise, one notable feature being a falling off of 1,500 tons in the supply from Bolivia during the first five months of the year. The middle of the month brought about an improved demand from consumers in Europe and America, while supplies were limited and under strong control. The cash price which, at the beginning of the month, had stood at £136 5s., now advanced rapidly until £140 5s. was paid: after which a slight reaction set in, prompted by heavy shipments from the Straits, and some consequent realizations. Thus the month closed with cash warrants at £139 10s., and three months' £138 5s.

July found immediate requirements satisfied, and consumers inclined to pause while sellers became rather pressing. An initial decline of 15s. was the only result, and was more than recovered within the first week, when consumptive inquiry suddenly revived on all sides. This continued unabated till the middle of the month, and the rise in prices was further

cash tin fetched £144 5s. Thereafter enstimulated by speculative buying, until terprise subsided in view of the Banka auction due toward the end of the month: and the cash price was allowed to fall back to £142 7s. 6d. But a surprise was in store. It was announced that sales of Billiton tin during next year would be reduced by about 1,400 tons, or practically 50 %. This news, together with sustained demand from consumers, caused the cash price to touch £145 10s. at a bound. Then came another startling announcement from the Dutch Colonial Minister, that sales of Banka during 1906 would have to undergo a further reduction of about 1,500 tons. This caused a rush of buyers, who quickly carried the price to £150 10s. for cash, and £150 for three months; this being the highest level touched for many years past. The usual reaction followed, prompted by realizations, notwithstanding the support afforded by consumers: and the month closed with a very sensitive market at £149 5s. for cash, and £148 2s. 6d. for three months.

August, which opened with some excitement due to the exceptionally strong position of the metal, soon saw the market relapse into dulness. In the temporary absence of leading operators, some small bear sales served to depress prices to £149 for cash, and £147 5s. for three months: but consumers were alert to take advantage of this move, and prices quickly recovered. Further efforts on the bear side proved futile, and offerings were readily absorbed by consumption which continued unusually active for the time of year. Later in the month trade received additional impetus as the prospect of peace brightened; a smart advance in silver, and a revival of American demand further advanced prices until cash warrants touched £153. A reaction followed, and the closing prices of the month were £149 10s. for cash, and £148 15s. for three months.

September opened with large sales for forward delivery at declining prices, due, apparently, to a sudden collapse in silver and a consequent fall in Eastern prices, resulting in £147 5s. being accepted for cash warrants, and £146 10s. for three months. Thereafter fluctuations were wide and numerous, and mostly downward, until cash touched £145 10s., and three months' £144 15s. The statistical position, however, was sufficiently strong to arrest further decline. Large quantities were absorbed by bull operators toward the close, and the bears hastened to cover their recent sales. The market was steady at the end of the month, with cash warrants at £146 15s. and three months' at £145 15s.

October found a hopeful sentiment prevailing, in consequence of trustworthy evidence that consumption had increased materially during the past twelve months, while production had lagged behind. Bears were accordingly less aggressive in their attacks on the market: and prices rose early in the month to £148 15s. for cash, and £147 15s. for three months'. This improvement was early dissipated by a message from Batavia to the effect that the output from the Banka mines had lately increased and would enable the Dutch Government to revert to its original intention of selling 9,500 tons during the ensuing year. This caused a relapse down to £145 10s. for early dates, and £144 10s. for three months'. Further decline was arrested by large buying orders from consumers, and the second half of the month saw a steady advance in values, partly attributed to advices of considerably reduced shipments from the Straits. Prices at one time touched £149 5s. for near delivery. There was then a slight relapse; but the month closed with abundant evidence of very small stocks in consumers' hands, and with cash warrants at £150 and three months' at £149.

November opened with a strong market, largely stimulated by American consumption, and with spot warrants fetching up to £150. The high prices, however, were fully justified by the statistics which revealed almost the smallest visible supply on record. The speculative element subsided early in the month, leaving the market strong under the influence of legitimate trade and with a still advancing tendency in prices. By the middle of the month some handsome profits had been made by realizations which, however, were readily absorbed; and the cash price rose to £152 17s. 6d., and that for three months' to £151 15s. Thereafter the market developed fresh strength and resisted all attempts to force prices down as many operators would have liked to do in view of the Banka sale at the end of the month. Competition at the sale was exceedingly keen, owing to the exhaustion of nearly all available supplies of this brand; and buyers had to pay over £160 per ton. The London prices at the close were £156 15s. for early dates, and £156 2s. 6d. for three months'.

December found bears eager to cover their sales, and the demand for cash warrants was enormous, so that within a few days the premium on these was over £3 per ton. A good speculation demand followed; raising the price for forward delivery so as to materially narrow the backwardation. Prices advanced daily until, on December 15, £166 5s. was paid for spot warrants. The pace was a little too rapid, though not surprising in view of the enormous demand for consumption and the news of large purchases of tin plates in England for American account. Thenceforward sellers showed themselves occasionally aggressive, but their offerings were readily absorbed, and fluctuations continued within narrow limits until just at the close, when sales were pressed in a quiet market, resulting in an unexpected fall from £164 15s. to £162 10s. for cash, with three months' proportionately depressed down to £161 10d. This decline is explained by pressing offers from Eastern merchants who, anxious to profit by the rising tendency of the Singapore exchange, were inclined to sell their production ahead.

THE LEAD MARKET.

The year opened with abundant indication of the improving state of trade, there being an active demand from consumers who had previously held aloof, while the speculative demand for extended delivery showed that the prevailing opinion was favorable. Prices rose to £13 for foreign, and £13 2s. 6d. for English; but the pressure of unsold parcels arriving throughout the month caused prices to drop to £12 15s. and £12 17s. 6d. respectively, notwithstanding the general refusal of producers to make any concessions.

February opened with less offering and with improved demand both for prompt and forward deliveries, though without any immediate improvement in values. The persistent pressure of arriving parcels gradually re-asserted itself and forced the price down to £12 5s., although buyers were willing to pay an appreciable premium for forward delivery. The situation was sufficiently clear to bring about a gradual improvement to £12 7s. 6d. for foreign, and £12 11s. 3d for English; at which figures the month closed rather quietly.

March saw the market depressed by eager sellers at a time when consumers were very reserved: the result being a fall down to £11 18s. 9d. for prompt delivery. This, however, was obviously unwarranted by the improving political outlook and by the general expansion of trade in all commodities, and the second week saw a sharp advance to £12 5s. for prompt and £12 10s. for forward. Thereafter sellers were firmer, while manufacturers became busier and had to replenish depleted stocks. The month closed with foreign at £12 11s. 3d and English at £12 13s. 9d.

April found the improved conditions well established, and further stimulated by increasing demand for export—notably to Russia. The home trade, however, was less active, which checked the otherwise impending advance and the closing prices were a little below the top, at £12 12s. 6d. for foreign, and £12 13s. 9d. for English.

May was a busy month in the home trade, while exports continued undiminished; and prices advanced steadily in spite of some determined attacks on the market by bear sellers. It became increasingly evident, however, that supplies were falling short of trade requirements: and the month closed at top prices, £12

18s. 9d. for foreign, and £13 10s. 3d. for English.

June was uneventful, but with a gradual advance, due to the steady demand, chiefly for home trade, and the ready absorption of all that was offering. For electrical purposes in particular there was sustained demand. The closing prices were £13 5s. for foreign, and £13 8s. 9d. for English.

July found increasing demand for export, chiefly to Russia and Japan, while the general requirements were such that in many cases a substantial premium was obtainable for prompt delivery. Early in the month it was found necessary to withdraw large quantities out of London warehouses, while diminished supplies from the United States and from Australia served to harden prices, which rose steadily throughout the month, closing at £13 15s. for foreign, and £14 5s. for English; this wide difference being attributable to the willingness of bear sellers to make the most of their opportunities for selling the foreign article for forward delivery at the enhanced prices.

August opened with a temporary setback, due to the persistent pressure to sell for forward delivery. Consumers, having covered immediate requirements, were satisfied to let the market drift awhile. But the undercurrent was strong enough to assert itself by the middle of the month, when dealers were alert to pick up any cheap parcels, and a large continental demand arose. American advices also helped to inspire confidence till, at the close of the month, £14 7s. 6d. was obtainable for foreign, and £14 12s. 6d. for English.

September at the outset was marked by an excellent demand for the home trade. When this was satisfied, prices fell away, in sympathy with other metals, until £13 15s. was accepted for foreign. Toward the close, however, an improvement set in, due in some measure to expansion of the electrical industry in the United Kingdom, but also impeded by a crisis in labor abroad so that after touching £14. 5s., foreign fell back to £14, with English at £14 5s.

October brought forth an active demand from consumers and dealers alike, resulting in an early advance to £14 10s. By the middle of the month a further advance of 5s. was established. Thereafter the speculative element operated adversely, and drew down the price from £15 to £14 12s. 6d.; but the consumptive demand again preponderated and numerous transactions took place at £15 for early delivery, the month closing with foreign at £14 17s. 6d. for extended delivery, and £15 2s. 6d. for English.

November showed no abatement in the demand which—for spot parcels—was unusually active. Early in the month £15 5s. was paid—and afterwards refused—for such parcels. Reports from America indicated increased firmnesss in that direction, and the market readily absorbed all lots which were offered in some cases with the obvious desire to depress prices so that the month finished with a decided advance in progress, foreign being then held for £16 2s. 6d. to £16 5s., according to time of delivery, and English for £16 5s. to £16 7s. 6d.

December revealed, at the outset, an exceedingly small supply of the metal, and buyers numerous and eager, both for near and distant deliveries. The scarcity of supplies was particularly apparent in the United States, and was such that the American market had to come to Europe for supplies—a reversal of the usual order of things. Naturally this caused some excitement on this side, intensified by the rising prices for metals generally. Home manufacturers, while complaining of slack trade, were alert to cover their requirements—near and distant—at successive advances in price. Before the middle of the month £17 8s. 9d. had been paid, at which point consumers seemed to have satisfied their immediate wants, whilst sellers became correspondingly eager—particularly some of the English smelters. The price relapsed rather suddenly to £16 17s. 6d., but quickly recovered to £17 2s. 6d. at which good quantities were taken for delivery extending into April. Further improvement developed during the closing days: and the latest figures were £17 10s. for foreign, and £17 10s. to £17 12s. 6d. for English lead.

THE SPELTER MARKET.

Like its immediate predecessor, the year 1905 saw steady and persistent advance in values, due to the irresistible force of expanding industry in consumption. Already in the first week of the new year large transactions were reported from the continent of Europe, at full prices, and for delivery extending up to midsummer. The English market, though less active, was also favorably influenced—particularly by the growing demand for galvanized iron. Consumers, while reluctant to buy far forward at the apparently high prices, then ruling, were prudent enough not to leave incoming orders uncovered. On the other hand speculators were tempted to push sales—particularly for extended delivery in the hope that prices might relapse by natural gravitation to a more normal level. Their efforts were temporarily successful in so far that January closed with ordinary brands £24 12s. 8d. to £24 15s. 4d. ex-ship, and specials at 2s. 6d. more representing a fall of 7s. 6d. over the month.

February opened with less activity in galvanized iron and in brass and yellow metal, so that bears seemed to have their opportunity. But labor troubles were threatening in several of the continental coal-mining centers, with a possible curtailment of the output of spelter and the market consequently remained steady awhile. The collapse of the coal strikes in Silesia and Belgium gave further encouragement to sellers who, later in the mouth, accepted down to £24 5s. ex-ship; at which point consumers and dealers alike stepped in and bought all that was offering. Thereafter the market was subjected to further attacks until prices were forced down to £24 for ordinaries and £24 2s. 6d to £24 5s. for specials.

March opened with transactions down to £23 15s.; but the evident depletion of stocks counteracted the apathy of consumers, and a temporary advance of 2s. 6d. was recorded, only to be followed by renewed onslaughts by sellers, resulting in a drop to £23 7s. 6d. Thereafter a recovery set in, and the month closed with ordinary brands £23 15s., and specials £24 to £24 5s.

April was uneventful until about the middle of the month, when improved demand for sheet zinc, and an enlarged trade in galvanized iron, raised price of ordinary brands to £24 for early delivery and about £23 15s. for forward delivery: which prices ruled up to the end of the month, with specials 5s. extra.

May brought forth fresh attacks which forced the price down to £23 10s., although the quantities thus offered were readily absorbed. An increasing demand from galvanizers did little more than improve prices by 2s. 6d. toward the end of the month, notwithstanding that continental producers were holding for much higher prices; and the closing price was £23 12s. 6d. for ordinary brands, and £24 to £24 5s. for specials.

June revealed abundant evidence of improved consumption on all sides, and a slow but steady advance carried prices up to £23 15s. and £24, according to time of delivery. Sellers, however, were intermittently aggressive, and the month closed with no further advance. Specials were quoted £24 2s. 6d. to £24 5s.

July opened with no appreciable change in values, but with accumulating evidence of large requirements. By the middle of the month ordinary brands commanded £24 2s. 6d. to £24 7s. 6d. Toward the close persistent pressure forced prices down at one moment to £23 15s.: but the month ended with a recovery in foreign to £23 18s. 9d., with specials at the relatively high figure of £24 10s. to £24 15s.

August found the preceding quotations still in force, but with less pressure to sell. Apart from the excellent reports from all the consuming districts, the United States gave ample indication of increased consumption with little prospect of replenishment of European stocks from that quarter, unless at enhanced prices. The inevitable advance in values was manifest early in the month, and continued uninterruptedly until the end, when foreign was quoted at £25 17s. 6d. and specials £26 7s. 6d.

September brought forth eager demand from all sides, notably from galvanizers, whilst prices of sheet zinc were raised repeatedly. There was little advance on the closing figures of August, however, as numerous sellers were desirous of taking profits, until about the third week. The scarcity of supply was now increasingly manifest, and thereafter prices advanced uninterruptedly to £27 7s. 6d. for foreign and £27 12s. 6d. for special brands.

October saw increased activity and confidence in commercial circles, due to the termination of the Russo-Japanese war. Transactions were consequently numerous and large, at successive advances, and extending over long periods. Foreign, by the middle of the month, commanded £28: which led to some transient business with America. But the prompt raising of American prices precluded further imports from that country. The month closed with foreign variously quoted about £28 10s., and specials £28 15s. to £29.

November opened with consumers fairly covered for their early requirements, and holding back in the hope of some reaction. Their abstention caused a temporary relapse to £27 15s.; but this was quickly followed by further advances, largely prompted by bear covering, and the month closed with foreign at £28 7s. 6d. and specials at £28 10s. to £28 15s.

December found the trade quiet, buyers being reluctant to pay ruling prices, and producers having practically nothing to offer. Elsewhere in Europe and America there were plentiful indications of advance in price; but the business in London was meager in volume until toward the middle of the month, when some considerable quantities changed hands at £28 15s. for ordinary brands. Quietness followed, though without any suspicion of weakness, producers having sold out for a considerable period ahead: and the market at the close was steady at £28 15s. The prospects for the coming year seem very good.

Preparation of Nickel Sulphate.

Nickel sulphate is made by dissolving oxide of nickel in sulphuric acid, adding sulphate of ammonia and then crystallizing. Nitric acid, which is detrimental to nickel deposition, is not present in salts made in this manner. The old method was to dissolve nickel in nitric acid and evaporate with sulphuric acid to drive off the nitric acid. It was, however, almost impossible to drive off completely the nitric acid unless several evaporations were made. Isaac Adams was the first to discover that nitric acid was the cause of the difficulty in depositing nickel by electrolysis; and when he obtained nickel salts which were free from it, he found it possible to deposit nickel in the cheap and successful manner that is done to-day.

New Publications.

Les Explosifs de Sureté au Siége d'Expériences de Frameries. By V. Watteyne and S. Stassart. Pages 71, 6 by 9 in. paper. Brussells, 1905. Mines Department of the Belgian Ministry of Industry and Labor.

Description of the methods and apparatus and of the explosives tested for safety in an atmosphere containing explosive gases or coal dust.

Practical Pattern Making. By F. W. Barrows. Pages, 326. Illustrated. 5 by 7½ in. Cloth; $2. New York, 1906. The Norman W. Henley Publishing Company.

Contents: Introductory. Pattern makers and pattern making. How some folks make patterns. Some methods. Pattern makers. Materials and tools. Lumber. Varnish. Miscellaneous materials. The bench and attachments. Hand tools. Bench work. Machine tools. The band saw. The circular saw. The lathe. Fillets. Stave work. Cant or segment work. Some examples of pattern work. Belt pulleys. Patterns for cable pulleys. Making patterns for chain wheels. Patterns for steam cylinders. One way of making a crosshead. Making gear patterns. Propeller wheels. Patterns for screws. Traction wheels for farm engines. Globe valve patterns. Metal patterns. Common practice. Some patterns. A stripping plate job. A vibrator plate pattern. Pattern shop mathematics. Drawings for pattern makers. To lay out a true spiral on the surface of a cylinder. Laying out the "half-moons and wings" for a globe valve core box. The "Square of the Sum." A graphical illustration of square root. A graphical illustration of cube root. Tables and formulas. Cost, care and inventory. Cost of patterns. The marking and record of patterns. Pattern accounts.

Professional Papers.

In this department are entered references to the important papers connected with or germane to the mining, metallurgical and chemical industries, which are published in the current engineering and technical periodicals, and because of their length, or other reasons, cannot be referred to in fuller abstracts in the JOURNAL. Whenever abstracts are to be published, however, references are not made in this department, the object of which is to supplement the remainder of our pages, so that the JOURNAL will constitute a full record of the progress in the art.

The Progress of Coke Manufacture in the Saar District. By Oscar Simmersbach. *Stahl und Eisen,* Dec. 1, 1905. Pages 1347-1351. Illustrated.

Contribution to the Analysis of Iron Ore. Correspondent of *Stahl und Eisen,* Dec. 1, 1905. Pages 1359-1631. A laboratory method for the determination of silica, barium, strontium, copper, lead, antimony, arsenic, iron, manganese, zinc, alumina, cobalt and nickel, calcium, chromium, magnesia, and sulphuric and phosphoric acids.

The Use of Ammonium Persulphate in the Determination of Chromium in Steel. By Harry E. Walters. *Proceedings* of the Engineers' Society of Western Pennsylvania, December, 1905. An abbreviated volumetric method applicable to chromium steels, but not directly to tungsten or molybdenum steels.

On the Determination of Sulphur by the Barium-chloride Precipitation, in the Presence of Interfering Elements. By G. Lunge and R. Stierlin. *Zeitschrift für angewandte Chemie,* Dec. 8, 1905.

Questions and Answers.

Concentration of Molybdenite.

What is the latest method for concentrating molybdenite? J. F. M. R.

Answer. — Molybdenite is commonly concentrated by crushing and washing on tables, in a manner analogous to the concentration of graphite. Inasmuch as molybdenite flakes badly, the losses in the process are likely to be high. Excellent separations have been made experimentally by means of the electrostatic separators, and it would be advisable to consider the application of that class of machines to the treatment of such ore. The Elmore oil process should also be considered in the concentration of molybdenite.

Copper Ore.

I have an ore with 40% of sulphur and 3 or 3.5 units of copper. Can you tell me how to utilize this to the best advantage? Transportation to the coast will cost so much that there would be no profit in working the ore. I have heard of a process which smelts the values into a matte, which can be transported with profit. Please give me some particulars. X.

Answer.—You should have no difficulty insmelting an ore of this character. Consult Peters' "Modern Copper Smelting."

Umpire Assaying.

When smelters shipments are submitted to an umpire, what is the customary arrangement for accepting the umpire's results, particularly in case of a Western product? That is to say, does the umpire's result hold, regardless of whether it is below the buyer's original figure, or above the shipper's claim?

Answer.—When a difference of assays requires the referring of the decision to an umpire, his results are usually accepted, provided they are between the limits represented by the original assays. If the umpire should come below these limits, there may be an agreement to accept either the umpire's figures or those of the two contestants coming nearest to those of the umpire. If the umpire's figures are above the limit of the original difference, his results may be taken, or those of the original which come nearest to the umpire's.

Titaniferous Iron Ores.

Can titaniferous iron ore be successfully smelted? What is the titanium content of some commercial deposits? T. R. S.

Answer—In the state of New York, in the Adirondacks and near Lake Champlain, there are deposits of titaniferous iron ores, some as rich as 57 to 58% iron with about 15%. TiO_2, and even as rich as 6% iron with 10.50% TiO_2. In Canada there are also large deposits, but generally not so rich, these being about like some of the Swedish ore, with 38 to 40% iron, though there are also other ores. In Minnesota, Michigan, Colorado, North Carolina and New Jersey there are further large deposits of this class of ore. Ores from New York and Canada have been used for the manufacture of ferrotitanium, but except for that purpose, blast furnace men, though admitting now that they can be smelted, are still rather shy in undertaking it, and will remain so as long as they can get, at a reasonable price, ores which are free from titanic acid. As the pure ores become exhausted, however, the titniferous ores will doubtless be worked and will prove an important resource of the future.

Trestle Construction.

I am preparing plans for a trestle of not over 10 ft. height and 137 ft. length, with bents every 12½ ft. Bent "one" is at station 24 + 37. Bent "last" at 25 + 75. The trestle is part of a vertical curve 400 ft. long, blending from 15.1 to 2.8% grade, and extending from station 23 to station 27 + 0. Would it be advisable to use corbels, owing to the grade on trestle, or the more simple "cap and stringer" form? This is part of a double track incline, which will drop five mine cars for every 900 ft., and return the same way by a continuous rope. W. D. M.

Answer.—Use the cap and stringer method, but splice the stringers (if they are not double), and put cross bracing in every other panel on each side (not in alternate panels). The cross bracing should, if practicable, be bolted to the stringers at the top and to the sills or posts at the bottom of the bents. If double stringers are used, the joints should alternate and in any case the posts and sills at the bottom; and the posts, caps and stringers at the top, should be doweled or bolted together. An excellent arrangement for this purpose is a ¾ in. square bar. This is cut to the required length and driven into ¾-in. round holes bored in the timber. The ends of the timbers should receive a coating of linseed oil or hot pitch before assembling.

Rubbing the surface of platinum with moist sea sand (round grains only), applied with the fingers, serves to remove the tarnish and to polish the metal without material loss.

A Notable Semi-Centennial.

The *Iron Age*, of this city, was founded in the summer of 1855; but the loss of the early office files has deprived the publishers of direct proof concerning the exact date of the first issue. They have, therefore, chosen the first number of 1906 as a jubilee number, appropriately commemorating the half-century of that journal's history. That number, which now lies before us, is notable evidence of the well-deserved prosperity of the *Iron Age*, and of that progress of the United States to which it has mightily contributed, in the arts and trades of which it has been a leading representative. The 439 quarto pages of advertisements command the hearty admiration (mixed, perchance, with a little honest Christian envy!) of fellow-journalists and publishers.

But these pages of advertisements tell also another and a more important story, presenting an amazing summary of the number, variety and volume of those American industries which have secured for this nation the acknowledged leadership of the world, through the developments of the most eventful half-century in the history of mankind. The simple enumeration of the processes and products, unknown in 1855 (to say nothing of those which were at that time found in other nations only), which are here illustrated as parts of the normal business activity of America, would constitute an epitome of human progress for that period. For the manufacture and use of iron and steel furnish the best index of that progress which political economists can devise or desire.

Both the birth and the christening of the *Iron Age* were singularly timely and appropriate. Unquestionably, its founders "builded better than they knew." For it was in 1855 that the first patents for the production of "pneumatic" steel were issued to Henry Bessemer, and the future historian will be unable to fix upon a better date for the real, effective beginning of that new era of progress which has revolutionized the industry of the world, or to find for that epoch a better name than *The Iron Age*.

The representative journal thus happily born and named has been ever since a faithful chronicler and intelligent critic—and not seldom a potent factor— of that stupendous movement, the significance of which, we are glad to see, is fully recognized in this semi-centennial number. It would be difficult to find a more interesting and instructive summary than the "Retrospect," beginning on p. 55, which we heartily recommend to all students of the really great historic changes, too little appreciated by the contemporary observers of the "burning questions" of politics.

This number contains also remarkably good portraits of John Williams, the original founder of the *Iron Age*, of David Williams, his son, who has controlled it since 1868, and of the members of its present staff, together with appreciative notices of those who were connected with it in former years.

The ENGINEERING AND MINING JOURNAL, a younger laborer in a somewhat different, though, in many respects, a similar and related sphere, hereby extends to the *Iron Age* its hearty congratulations and good wishes.

The Coal Industry in Washington in 1905.

BY C. F. OWEN.

While the coal output of the State for the summer months was less than that of the previous year, yet the impetus of the trade during the past four months will nearly overcome the decrease of output of the previous months. The output of coal for 1904 was 2,905,689 tons, and 46,179 tons of coke. The coal output for 1905 probably showed a decrease of 100,000 to 150,000 tons. The amount of coke produced equaled if not exceeded that of the previous year. The prices of both coal and coke were about the same as for 1904.

The outlook for 1906 trade is very encouraging. The rapid development of the State's resources is creating a home market for the coal that is rapidly overcoming the loss in the California market, due to the use of fuel oil. The output of 1906 will exceed that of 1905 by half a million tons. The commercial trade during the last quarter of 1905 was nearly double that for the corresponding months in 1904. The assurance of two or more Transcontinental roads, and the building of terminals on Puget Sound, have increased the demand for coal lands in this state.

All of the coal mines are working full time. The Pacific Coast Campany has resumed operation of the Gem mine at Franklin, King Co., which was closed during the summer months. The company will electrify its mines at Black Diamond in 1906. The South Prairie Coal Company will also instal an electric haulage system in its mines at Burnette, Pierce county.

The Northwestern Improvement Company has sunk a slope in its mine at Melmont, Pierce county; it has made new openings at Mine No. 5, Roslyn, and has installed a powerful ventilating fan at Mine No. 2. It has sunk a slope to the third level on its Ravensdale property, King county, and has opened the McKay vein at the same place.

The coke ovens of the Wilkeson Coal & Coke Co., Wilkeson, Pierce county, and the W. A. Company at Fairfax, Pierce county, have been in constant operation during the year.

P. Gibbons has sunk two slopes on his property near Palmer, King Co. The Crescent Coal Company at Littell, Louis county, has sunk a slope and will instal a briquet plant at its mine during the

coming year. Extensive lignite measures are being developed in the Hanniford valley, near Centralis, Louis county.

The Tacoma & Eastern Railroad Co. is developing coal measures on its main line at Ashford, Pierce county, and on the Mineral Lake Branch. Mr. W. M. Ladd, of Portland, is developing coal measures in Louis county on the line of the Tacoma & Eastern railroad.

The Seattle Electric Company at Renton, King county, is working full time and is increasing its output; it is continuing the main slope and opening new territory.

The Snoqualmie Coal & Coke Company, Snoqualmie, King county, is to instal a battery of coke ovens at its mine this year.

Patents Relating to Mining and Metallurgy.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications, correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week Ended Dec. 26, 1905.

808,066. PROCESS FOR THE PRODUCTION OF METALLIC CALCIUM.—Wilhelm Borchers and Lorenz Stockem, Aachem, Germany.

808,081. APPARATUS FOR COOLING AND DRYING OILCAKE.—Alfred W. French, Piqua, Ohio.

808,086. THERMO-ELECTRIC BATTERY. Albrecht Heil, Frankfort-on-the-Main, Germany, assignor to the firm of A. Wolf, Jr., & Co., Frankfort-on-the-Main, Germany.

808,100. PROCESS OF MAKING CHLORIDES OF CARBON.—Florentine J. Machalske, Brooklyn, N. Y., assignor to Frederick Darlington, Great Barrington, Mass.

808,103. ART OF GALVANIZING METALS.—Guy L. Meaker, Evanston, Ill., assignor to The American Steel and Wire Company of New Jersey .

808,108. DOOR CONSTRUCTION FOR STORAGE-RECEPTACLES. Arthur D. McMahan, Centerville, Ind.

808,125. MINE-DOOR.—Alfred C. Urban, Buxton, Iowa, assignor of one-half to Nathan P. Herrington and one-fourth to Eric F. Brown, Buxton, Iowa.

808,141. METHOD OF MAKING LEAD HYDRATE.—George D. Coleman, Boston, Mass.

808,174. ROTARY FAN.—Howard D. Slear and Chester G. Arnold, Grangeville, Idaho.

808,183. CABLE-HAULAGE AND CARRIER-TRANSFER.—Tony Alexander, Brookhaven, Mass.

808,187. METALLURGICAL FURNACE.—George H. Benjamin, New York, N. Y.

808,232. ELECTROLYTIC METER.—Alvarado L. R. Ellis, Lynn, Mass., assignor to General Electric Company, a corporation of New York.

808,244. GAS-PRODUCER.—Ernst Keerting, Hanover, Germany.

808,246. HOISTING AND CONVEYING APPARATUS.—Thomas S. Miller, South Orange, and Joseph H. Dickinson, Montclair, N. J.

808,273. HOIST AND SIMILAR APPARATUS.—Philip J. Darlington, Glenridge, N. J., assignor to Sprague Electric Company, a corporation of New Jersey.

808,275. APPARATUS FOR EXPLODING MINE CHARGES.—Charles I. Dodson, Pittsburg, Kans.

808,291. DEVICE FOR DETACHING LOADS FROM ELEVATORS, &c.—George C. Mackrow and Herbert G. Cameron, London.

808,293. ROASTING-FURNACE. Frank E. Marcy, Chicago, Ill.

808,328. SAFETY DEVICE FOR MINE SKIPS, CAGES, LIFTS, AND THE LIKE.—James Wilshir, Germiston, Transvaal.

808,345. EXCAVATOR.—Albert N. Cross, Tomah, Wis.

808,361. PROCESS OF ROASTING ORES.—Herbert Haas, San Francisco, Cal.

808,365. GAS-GENERATOR.—Henry A. Hartman, Philadelphia, Pa.

808,367. MOLDING APPARATUS.—Alfred M. Hewlett and Maddra J. Hewlett, Kewanee, Ill.; said Maddra J. Hewlett assignor to said Alfred M. Hewlett.

808,368. METHOD OF MOLDING.—Alfred M. Hewlett, Kewanee, Ill.

808,377. ROCK-DRILL OF THE PERCUSSION TYPE. Walter C. Johnson and George C. Pearson, Old Charlton, England.

808,378. AUTOMATIC ROTARY HYDRAULIC CASING-SPEAR.—Horace G. Johnston, Corsicana, Tex.

808,382. OXYHYDROGEN-BLOWPIPE.—Felix Jottrand, Uccle, Belgium.

808,421. SPECIFIC-GRAVITY BALANCE. Frank M. Williams, Potsdam, N. Y.

808,452. STEAM-SHOVEL.—Olaf Hetlesaeter Milwaukee, Wis., assignor to Allis-Chalmers Company, Milwaukee, Wis., a Corporation of New Jersey.

808,453. SILVER ALLOY.—Arthur E. Hobson, Meriden, Conn.

808,481. DRYING APPARATUS. Frank M. Schaffer, Indianapolis, Ind.

808,488. COMBINED APPARATUS FOR GRINDING OR CRUSHING, WASHING, AND SEPARATING ORES.—Reginald Stanley, Nuneaton, England.

808,493. MEANS FOR TURNING HOISTING-BUCKETS.—George E. Titcomb, Philadelphia, Pa., assignor to The Dodge Coal Storage Company, Naugatuck, Conn., a corporation of Connecticut.

808,529. HYDROCARBON-BURNER.—Benjamin Q. P. Foss, San Jose, Cal., assignor to Foss Water Burner Company, Chicago, Ill., a Corporation of Illinois.

808,542. PROCESS OF ENAMELING.—Joseph H. Hines, Philadelphia, Pa.

808,584. ORE-CONCENTRATING APPARATUS.—Xavier St. Pierre, Ruby, Mont.

808,590. CLAY-SCREEN.—Neal Allen, Pittsburg, Kans.

Reissues.

12,427. GLASS-DRAWING MACHINE.—George H. Harvey, Glenfield, Pa., assignor, by mesne assignments, to Brownsville Glass Company, Pittsburg, Pa., a Corporation of Pennsylvania.

Week Ended Jan. 2, 1906.

808,618. METHOD OF CONVERTING MATTE.—Charles M. Allen, Lolo, Mont., assignor to Ralph Baggaley, Pittsburg, Pa.

808,630. GRAB-BUCKET.—Alexander E. Brown, Cleveland, Ohio, assignor to the Brown Hoisting Machinery Company, Cleveland, Ohio.

808,632. HOISTING-MACHINE.—William M. Brown, Gibsonburg, Ohio.

808,636. EXCAVATOR.—Frank F. Collath, Milawukee, Wis.

808,637. ELEVATOR MECHANISM.—William Crossley, West Haven, Conn.

808,649. METHOD OF DISTILLING AND CONDENSING. John S. Forbes, Philadelphia, Pa.

808,655. HYDRAULIC HOIST. Urban Harvey, U. S. Revenue-Cutter Service.

808,670. WINDLASS.—Thomas F. Mason, Colonial Beach, Va., asignor of one-half to Thomas Perry Watson, Colonial Beach, Va.

808,675. LEACHING-TANK.—Andrew B. Mouck, Twisp, Wash., assignor of two-thirds to Robert S. Lewis and Treadwell Twichell, Fargo, N. D.

808,682. CENTRIFUGAL, TURBINE, OR SIMILAR PUMP.—Frederick Ray, East Orange, N. J., assignor to Henry R. Worthington, New York, N. Y., a Corporation of New Jersey.

808,691. METHOD OF PLANISHING SHEETS OF METAL.—Ambrose Ridd, Newport, Ky.

808,710. FALL-ROPE CARRIER.—Edward K. Young, Middle Fork, Ohio.

808,741. COKE-HANDLING APPARATUS.—George G. Fryer, Syracuse, N. Y.

808,750. DUMPING-CAR.—Fred M. Hubbard and Charles E. Taylor, Chicago, Ill., assignors, by mesne assignments, to National Coal Dump Car Company, Rapid City, S. D., a corporation of South Dakota.

808,752. HELICALLY-RIFFLED FLUID PIPE-LINE. John D. Isaacs, Oakland, and James E. Speed, Berkeley, Cal., assignors to Rifled Pipe Company, San Francisco, Cal., a corporation of California.

808,776. PROCESS AND PRESS FOR PRESSING PULVEROUS MATERIAL.—Curt von Pelchrzim and Johaan Thümmel, Ehrang, Germany.

808,782. FLUID PIPE-LINE.—James B. Speed, Berkeley, Cal., assignor to Rifled Pipe Company, San Francisco, Cal., a corporation of California.

808,798. APPARATUS FOR THE AGITATION OF SOLUTIONS USED IN ELECTRODEPOSITION OF METALS. William C. Wood and Bertie Oaksford, London, England, assignors to W. Canning & Co., Birmingham, England.

808,800. LEVEE-BUILDING SUCTION-DREDGE. Frank V. Wright, San Francisco, Cal.

808,804. GLASS-FURNACE.—William M. Anderson, Pittsburg, Pa.

808,810. GLASS-FURNACE. Henry M. Brookfield, New York, N. Y.

808,836. METHOD OF MIXING CONCRETE.—Peter C. Hains, Washington, D. C.

808,837. ROCK AND COAL DRILL.—Lester C. Hardsocg, Otumwa, Iowa.

808,839. PROCESS OF TREATING ORES. Justin H. Haynes and Wilber D. Engle, Denver, Colo., assignors to the Dolores Refining Company, Denver, Colo.

808,849. METHOD OF TREATING MOLTEN MATTE.—Walter E. Koch, Pittsburg, Pa.

808,997. CONCENTRATOR FOR SOLUTIONS.—John U. Lloyd, Norwood, Ohio.

809,021. PROCESS OF PREVENTING THE FORMATION OF CLINKER IN GAS-PRODUCERS. James E. Sheaffer, Burnham, Pa., assignor to one-half to Orville C. Skinner, Burnham, Pa.

809,023. GAS-PRODUCER.—Orville C. Skinner and James E. Sheaffer, Burnham, Pa.

809,067. SIEMENS REGENERATIVE FURNACE.—Adelbert Kurzwernhart, Zuckmantel, near Teplitz, Austria-Hungary.

809,085. ELECTROLYTIC APPARATUS.—Henry S. Blackmore, Mount Vernon, N. Y.

809,086 and 809,087.—PROCESS OF EXTRACTING SULPHUR FROM THE SULPHUR-CONTAINING CONSTITUENTS OF PETROLEUM.—Henry S. Blackmore, Mount Vernon, N. Y., assignor, by direct and mesne assignments, to Black-Ford Utility Oil Company, a Corporation of the District of Columbia.

809,088. PROCESS OF PRODUCING CAUSTIC ALKALI.—Henry S. Blackmore, Mount Vernon, N. Y.

809,089. PROCESS OF MAKING CAUSTIC ALKALI.—Henry S. Blackmore, Mount Vernon, N. Y.

809,111.—MINER'S-LAMP SAFETY-SHIELD.—Richard I. Jenkins, Lewistown, Mont., assignor of one-tenth to B. F. Marsh, Lewistown, Mont.

809,116. METHOD OF PRODUCING CIRCULATION IN ELECTROLYTIC PROCESSES.—Hugo Koller, Vienna, Austra-Hungary, and Paul Askenasy, Nuremberg, Germany.

809,123. APPARATUS FOR GENERATING STEAM FROM HOT SLAG.—George Mitchell, Los Angeles, Cal.

809,190. WELL-PULLING MACHINE.—Oliver D. Kraft and Louis W. Fetzer, Findlay, Ohio.

809,218. APPARATUS FOR THE SEPARATION OF GASES FROM THEIR MIXTURES.—Raoul P. Pictet, Berlin, Germany.

809,219. APPARATUS FOR DEHYDRATING COMPRESSED GASES.—Raoul P. Pictet, Steglitz, Germany.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

Week Ended Dec. 23, 1905.

25,527 of 1904. COKE-OVEN.—H. Koppers. Essen-Ruhr, Germany. In coke ovens, improvements in the design so that the size of the flues for the heating gases shall be increased without weakening the structure.

1,382 of 1905. WELL-DRILLING MACHINE. W. Harker, A. T. Alcock and J. W. Cable, London. In deep boring machinery in which the boring tool is raised by a rope and allowed to fall, improved methods of release so as to produce a sharper blow each fall.

3,806B of 1905. BRIQUETTING MACHINE.—J. Treadwell, San Francisco. Improved device for lubricating the plungers of briquetting machines.

15,505 of 1905. ELECTROLYTIC PROCESS.—Gantz & Co., Ratibor, Germany. In plants for the extraction of metals from ore by means of solutions obtained by the electrolysis of salt, methods of arranging the relative positions of the electrolytic cell and the extraction chambers, so as to decrease the electric resistance of the cells.

20,898 of 1905. ELECTROLYTIC APPARATUS—C. N. Ruber, Christiania, Norway. Improved method of protecting the diaphragms used in electrolytic apparatus.

Personal.

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Mr. J. O. Harron, of San Francisco, was recently in Los Angeles.

Mr. H. A. Wheeler of St. Louis, has been visiting New York.

Mr. Walter H. Weed, of Washington, D. C., was a recent visitor in New York.

Mr. E. C. Engelhardt has returned to Denver from a professional trip in New Mexico.

Mr. G. M. Gouyard returned to Denver from a professional trip to Mexico, a few days ago.

Mr. I. D. Beahm, of Beaver Brook, Pa., has been appointed manager of the Hooker colliery.

Mr. F. P. Bailey, formerly of Ouray, Colo., is now at the Gold Roads mine in California.

Messrs. C. F. and R. B. Hoffman have returned to San Francisco from a trip to New York.

Division Superintendent Kaercher, of the Reading Co., has resumed work after a long illness.

Mr. U. Tsukakaoshi has been appointed to a position at the Detroit copper mine, in Morenci, Arizona.

Mr. Charles L. Whittle, of Boston, is now in Costa Rica, examining some gold mining properties.

Mr. H. W. Ogilbee has returned to San Francisco from the Salmon River district, in northern California.

Mr. E. W. Sebben is at present examining copper properties in Cochise and Yavapai counties, Arizona.

Mr. K. Hasigawa has been appointed to a position with the Copper Queen Consolidated Co., at Bisbee, Arizona.

Mr. W. J. Grigsby has been appointed superintendent of the Phœnix mine and mill, at Johannesburg, California.

M. Henri Moissan, professor of chemistry at Paris, has been elected a foreign member in the Munich Academy of Sciences.

Mr. C. A. Wright, president of the Keweenaw Copper Co., recently returned to Hancock, Mich., from a business trip to New York.

Mr. August Mathez has returned to Denver from a six months' trip to Australia, where he has been investigating mining properties.

Mr. Courtenay DeKalb has gone to Mexico, where he will examine some mines in the neighborhood of Guadalupe y Calvo, Chihuahua.

Messrs. George W. Huddleston and T. J. Marshall, of New York, recently visited Vulcan, Colo., in company with F. J. Brandes, of Denver.

Mr. R. C. Pryor of Houghton, Mich., president of the Superior Copper Co. and the Lake Copper Co., was in Milwaukee on business last week.

Mr. W. M. Davis, of Los Angeles, has taken charge of the mill at the Mount Vernon mine, in Mountain Spring cañon, Kern county, California.

Mr. F. McM. Stanton, agent of the Atlantic and Baltic mines in the Michigan copper district, spent the holidays with John Stanton of New York.

Mr. James Long, superintendent of the Silver Brook colliery near Scranton, Pa., has resumed his duties, after a long vacation for the benefit of his health.

Mr. James MacNaughton, general manager of the Calumet & Hecla Mining Co., has returned to the Lake Superior copper district from a business trip to Chicago.

Mr. Frederick S. Harris, who has been examining mines in Mexico, left Chicago the first week in January for a two months inspection of mines at Goldfield, Nevada.

Mr. Daniel C. Tobin, owner of the Continental gold mine at Vulcan, Gunnison county, Colo., has returned to that place from a business trip to Chicago and St. Louis.

Mr. S. R. Kaufman of Marquette, Mich., secretary and treasurer of the Chiricahua Development Co., has been at Paradise, Ariz., recently on business connected with the company's property there.

Mr. Wm. H. Schlemm, who has been for some time engaged in the installation of a large cyanide plant at San Ramon, Tamazula, Mexico, has completed that work, and has returned to his office in the city of Durango.

Mr. Guy C. Stoltz, of Salt Lake City, Utah, has left the firm of Stoltz & Locke, mining and metallurgical engineers, to accept the position of assistant superintendent for the Corinthian Mines Co., at Esparto, Costa Rica.

Dr. George W. Maynard, of New York, is now at Cerro Colorado, Sonora, Mexico, examining some mining properties. He expects to remain in Mexico for some time, and will probably return by way of California, Nevada and Utah.

Captain James Hoatson, president of the North Butte Mining Co., vice-president of the Calumet & Arizona Mining Co., and prominently identified with other Arizona copper mines, has returned to Calumet, Mich., after an extended tour of Europe.

Mr. John Crooks has been appointed paymaster of the Coxe Brothers collieries by the Lehigh Valley Co. Mr. Henry Sweeney, who had been paymaster for many years and was retired by the new owners, received a gift of $5,000 from the Coxe estate.

We learn from "Nature" that it is proposed to erect a statue in Freiburg, Saxony, to the memory of the late Professor Dr. Clemens Winkler, who was professor in the Royal Mining Academy at Freiburg, and died in Dresden last year. The proposed memorial is to take the form of a large block of granite decorated with a medallion picture of the deceased investigator and a short account of his life's work.

Mr. Harry Myers, part owner and superintendent of the Brookwood colliery and Raven Run washery, operated by Madeira, Hill & Co., at Raven Run, Pa., resigned Jan. 1, 1906. He will hereafter fill the position of superintendent of the Hudson washery, operated by Smith, Myers & Lineaweaver. W. G. Thomas, of Pittston, Pa., has been appointed general manager of all the anthracite operations of Madeira, Hill & Company.

Obituary.

William M. Thomas, who died in Wilkes-Barre, Pa. last week, was one of the oldest and most expert mine foremen in the anthracite region. He had worked in various collieries in the Wyoming valley for over 40 years.

Charles S. Guthrie, chairman of the Republic Iron and Steel Co., and one of the most active members of the syndicate which acquired control of the Tennessee Coal and Iron Co., recently, died at his shooting preserve in the North Carolina mountains on Jan. 3, after an operation for appendicitis. Mr. Guthrie was well known among Pittsburg steel men, and was president of the American Steel Hoop Co. at the time it was absorbed by the United States Steel Corporation. He had lived in New York for six years, and was a member of the Union and other clubs, and a noted sportsman.

Dr. Otto A. Moses died at his residence in New York, Jan. 3, after a brief illness. Dr. Moses was a son of Aaron J. Moses of Charleston, S. C., where he was born in 1846. He took a scientific course at the University of Liepsic, and on his return to this country he began business as a mechanical engineer and electrical expert. For several years he represented Edison in Paris, and was largely instrumental in introducing the Edison inventions in Europe. Previous to his removal to this city, he was State Geologist of South Carolina and had general supervision of the phosphate works. He had an established reputation as a chemist and geologist, and was frequently called on for consultation. He was actively interested in the Hebrew charities of New York.

Societies and Technical Schools.

Canadian Mining Institute.— Preliminary notice is given that the annual meeting for 1906 will be held in the City of Quebec, March 7, 8 and 9. Further particulars will be published as soon as the programme is completed.

Western Pennsylvania Central Mining Institute.—At the winter session, held Dec. 20 and 21, in Pittsburg, the name of the organization was changed to the Coal Mining Institute of America, and the institute will be made general instead of local in its scope. A two-days' session was held, officers were elected and a banquet was given at the Hotel Henry. The office of secretary-treasurer which had been held for several terms by I. G. Roby was separated, Mr. Roby being retained as treasurer and C. W. Smith being elected secretary. All the other officers were re-elected as follows: President, Fred C. Keighley; vice-presidents, William L. Affelder, L. L. Logan and Joseph Simpson; auditors, Thomas Hall and John Britt; editor, Fred C. Keighley. About 100 members attended the meeting.

President Keighley in his annual address said, in part: "I wish to draw your attention particularly to mines where rib-drawing is being carried on extensively, and this condition comes to all extensive mines at various periods of their history. A coal mine of this description, or rather in the stage of rib or pillar drawing, is often seriously injured and in some cases practically ruined, by a sudden cessation of work. There being no market for the coal, the work is stopped, but the weight goes right on right over the ribs and even on to the solid coal, not only destroying timber, roads, drains, air-courses and tracks, irretrievably burying thousands of tons of coal, but adding many-fold to the cost of producing the coal that can be gotten, and cutting down the output for months perhaps; or in lieu of that, causing the management to attack other coal (to keep up the ouput) that was being held in reserve for the regulation of output and cost in future years of mining." President Keighley drew interesting comparisons between the old and the modern methods of coal mining. He stated that labor-saving machinery and broad-gauge management of mines had been responsible in revolutionizing operations in Pennsylvania coal fields.

At the first day's session papers were read on technical subjects by George T. Wilkes, Thomas W. Keighley, Horatio S. Moore, William Hardy and L. L. Logan. At the banquet in the evening President Keighley introduced William L. Affelder as the toastmaster. Among the toasts responded to were: "History of the Institute," Fred C. Keighley; "Future of the Institute," C. W. Smith; "Hydro-Carbon," Josiah Evans; "Gas," L. L. Logan; "The Coal Baron," Mr. Meagher; "The Down-trodden Miner," Mr. Herron; "Hot Air," Mr. Dixon.

On Dec. 21, the regular meeting was resumed in the Allegheny county court house. The following papers were read: "Mechanical Mine Ventilators," J. R. Robinson; "Electric vs. Compressed Air Drills," J. H. McCoy; "Late Methods of Rib Drawing," Elias Phillips; "Should the Present Mining Laws be Revised and How?" Thomas K. Adams; Electric Pumps, and their Relation to Steam and Compressed Air Pumps," R. L. Aldrich; "What are the Three Essential Principles Governing the Operation of Coal Mines?" Thomas A. Jackson. An adjournment was then taken until the summer meeting to be held in July, 1906, at a place to be decided upon later.

Trade Catalogues.

The Star Electric Fuse Works, Wilkes-Barre, Pa., issues a new catalogue.

The Keystone Driller Co., Beaver Falls, Pa., issues its 1906 catalogue of Keystone Drills.

P. H. & F. M. Roots Co., Connersville, Ind., send out a catalogue of smelting blowers.

The Leavitt Machine Co., Orange, Mass., issues its catalogue No. 14, "How to stop the leaks."

Catalogue No. 21 of the Capital Gas Engine Co. is descriptive of the engines made by this company.

"Underground Wire Rope Haulage" is a new catalogue of the Broderick & Bascom Rope Co., St. Louis, Mo.

William Ainsworth & Sons, Denver, Colo., issue a catalogue "B" describing the Brunton Patent Pocket Transit.

McClave grates and Argand blowers are described in the new catalogue of the McClave-Brooks Co., Scranton, Pa.

The Humphrey Machine Co., Keene, N. H., manufacture turbine water-wheels, and describe them in a new catalogue.

Gold dredging machines as made by the Urie-Snyder Dredge Co., Kansas City, Mo., are described in its new catalogue.

The Crown Drilling Machine Co., Akron, O., issues a catalogue "B," for 1905, describing well-drilling machinery.

J. H. Williams & Co., 115 Hamilton Ave., Brooklyn, N. Y., have issued new catalogues of wrenches and drop forgings.

Filter presses are described and illustrated in the catalogue of T. Shriver & Co., 33 East Fifty-sixth street, New York.

The Flint & Walling Manufacturing Co., Kendallville, Ind., issues catalogue No. 42. This describes tanks, windmill towers, and deposition vats.

The Union Steam Pump Co., Battle Creek, Mich., publishes a flyer describing Burnham mine pumps, and a catalogue of its entire product.

The Hazard Mfg. Co., 50 Dey street, New York, publishes two catalogues, describing electrical wires and cable, and wire rope, respectively.

The electrical department of the Allis-Chalmers Co., Cincinnati, O., issues its bulletin No. 1046 describing Bullock multipolar motors and generators.

The Ottumwa box car loader is described and shown in operation through the medium of half-tones in the new catalogue of the Ottumwa Box Car Loader Co., Ottumwa, Iowa.

The Westinghouse Electric & Manufacturing Co., Pittsburg, Pa., publishes circular No. 1127, describing control apparatus and pantagraph trolleys for single-phase railway system.

The Jacobson vises are described in a pamphlet sent out by Armstrong, Walls & Co., 82 Centre street, New York. The same company's gas and gasoline engines are illustrated in a separate catalogue.

The Flexible Metallic Tubing Co., 133 West Sixty-fifth street, New York, are American agents for the United Flexible Metallic Tubing Co., of Ponders End, Middlesex, England. They issue a catalogue of this well-known material.

The Siemens & Halske Altiengesellschaft issue, through their United States agent, the Fidelity International Agency, 621 Broadway, New York, a series of pamphlets and bulletins describing mine telegraph, power arrangements for hoisting engines, mine telephones, and general supplies.

Industrial Notes.

John A. Cruikshank, associated with Western interests, has optioned 200 acres of land near Mason City, Ia., on which he proposes to erect a large cement plant. The company will be known as the Iowa Portland Cement Company.

Warren Wood, President of the Wood Drill Co., entertained the firm's employees in the new addition to the factory at Paterson, N. J., on Jan. 3. The function emphasized the good relations existing between the company and its employees. About 75 persons attended.

The Ingersoll-Rand Co. announced that it has secured exclusive control of the product of the Imperial Pneumatic Tool Co., with shops at Athens, Pa. The line of Imperial tools, includes pneumatic hammers, drills, riveters, reamers, hoists and plug drills. The Ingersoll-Rand Co. is manufacturer also of the Haeseler pneumatic tools.

Between 200 and 300 coke ovens at Bennington, Pa., which were the property of the Webster Coal & Coke Co., but which

have been idle for the past three years, have been purchased by the Cambria Steel Co., of Johnstown, and will be placed in operation in the near future. The work of getting the old ovens ready for operation is nearly completed and after they are fired up a number of new ones will be built.

The California Gas & Electric Corporation has closed a contract with the Pelton Water Wheel Co., for a 10,500 h. p. unit to be located at the Deer Creek station. The unit is to operate under an effective head of 765 ft. and will be direct connected to a 5,500 kw-300 r. p. m. generator. Two Pelton wheels are used, one mounted on each end of a single 20 in. nickel-steel shaft which carries the rotor (45,000 lb. weight) of the engine type generator.

A recent order placed with the Ingersoll-Rand Co., of New York, shows the continued tendency toward centralization of air power in large units in mining plants. The United Verde copper mine at Jerome, Arizona, has just contracted with the manufacturers mentioned above for a cross-compound condensing two-stage Corliss air compressor which, when installed, will be the largest compressor unit in Arizona and the Southwest. The order calls for a 48-in. stroke machine, with steam cylinders 28 and 52 in. in diameter and air cylinders 44¼ and 26¼ in. Steam cylinders are jacketed, with valves in the heads. The machine is to operate under 110 lb. steam pressure and a vacuum of 20 in.; a very high steam economy is guaranteed. The air cylinders will be jacketed on heads and barrels, and will be fitted with the piston inlet air-valves. The compressor will run at 75 r. p. m. at which the piston displacement will be 6060 cub. ft. of free air per minute. The air pressure is to be 100 lb. and the altitude is about 5,500 ft. above sea-level.

The Pelton Water Wheel Co. reports having closed a contract with the Vancouver Power Co., of Vancouver, B. C., for a plant consisting of a 3,000 h. p. Pelton unit of the "double overhung" type, direct connected to a 1,500 kw. 200 r. p. m. generator; the operating head is 390 ft. The Pelton Co. has also received a contract for the pipe line, consisting of approximately 1,050 ft. of pipe, varying from 48 in. diam. to 42 in. This is furnished from the Eastern works of the company, and the contract calls for the material delivered and installed in place. The Columbus Consolidated Mining Co. of Utah has duplicated its order for a 750 h. p. Pelton wheel, the original of which was installed two years ago, and the United Light & Power Co., of Georgetown, Colo., is installing another 1,000 h. p. Pelton unit. The Fremont Power Co. of Washington has ordered two Pelton wheels for direct connection to 400 kw. generators. A recent contract with the Northwest Light & Power Co. of North Yakima, Wash., covers a Pelton unit for driving a 350 kw. generator.

Construction News.

Istachatta, Florida.—The Istachatta Phosphate Co. is in the market for 3½ miles of track; 40-lb. rails will be used. A 1¾-yd. dipper dredge is also required.

Greenwood, Arkansas.—A company has been organized with Jesse A. Bell, president, and C. D. Murphy, secretary, to drill for gas and will purchase a drilling outfit.

Potosi, Bolivia.—Senores Lopez Hermanos of Potosi, Bolivia, mine-owners, are considering better equipment, safety appliances, etc., catalogues of which are requested.

Nashville, Tennessee.—The Southern States Development Co., 1211 First National Bank Building, Nashville, requires machinery and equipment for mining phosphate and coal.

Jennings, Louisiana.—Heywood Bros. of Jennings and the Lake Oil Co of St. Martinsville, La., operating at Anse le Butte, will together construct a 4-in. pipe line from the oilfields to Breux Bridge, Louisiana.

Marion, Kentucky.—The Sanders Ore Separating Co. has been incorporated with $20,000 capital stock to concentrate ores and other mineral products. Walter Sanders of New York is president; and Cyril C. Sanders of Marion secretary-treasurer.

Crab Orchard, Tennessee.—Work has begun on the development of gray marble deposits on which R. H. Ward of Harriman has an option. The property will be further developed and operated by the American Gray Marble Co., the main office being located at Harriman, Tennessee.

Bonneville, Boxelder County, Utah.—The Utah Smelting Co. is to erect a new plant at this place. A sampling mill and briquetting plant will be erected, as well as the 200-ton smelter. Bela Kadish, Ogden, Utah, is general manager and can give information relative to equipment required.

Hopkinsville, Kentucky.—The West Kentucky Stone Co. is in the market for quarrying machinery, derricks and contractors' supplies. L. Hayden, of Hopkinsville, is president and A. R. Givens, of Elkton, has charge of the quarries. Oolite stone is to be produced and offices at Paducah will be occupied.

Wilmington, North Carolina.—A large modern fertilizer factory to cost about $250,000 is to be built upon the former site of the Pittsburg Lumber Co's. plant at Wilmington. The plant will be of mill construction, with some reinforced concrete; an electric plant will be installed for operation of an overhead railway. A 300 h. p. plant will be erected. Docks will be constructed and the river dredged. B. H. Stephens of Chicago is in charge, and has offices at 401 Southern Building Wilmington; he wishes catalogues of machinery.

Special Correspondence.

San Francisco. Jan. 4.

The California Debris Commission, which has charge of the granting of licenses to mine by hydraulic process in the drainage basin of the Sacramento and San Joaquin rivers, and the general supervision of that business, states in its annual report, that up to June 20 this year it received 699 applications to mine by the hydraulic process and had granted 532, "the applicants in these cases having, in accordance with the law, either built dams to properly impound near the mines the debris resulting from their operations, or shown that other satisfactory facilities existed which would accomplish the same result. During the same period 397 permits have been revoked, principally for the reason that mines have been worked out or abandoned".

In some localities, says the report, whole hillsides have been washed down to bedrock, "the debris resulting therefrom passing into the rivers and natural water-courses,', because in the early stages of mining no particular attention was paid to the effect that the dumping of this debris in the near-by cañons would have upon the river channels and the adjacent lands.

"This," says the commission, "has caused the rivers partially to fill up, to the detriment of navigation, and in times of high water has caused them to overflow their banks to the damage of adjacent farm lands. The dimensions of the phenomenon wrought by the unrestricted hydraulic mining operations became enormous. Legal action was finally taken and the cases carried to the courts. These resulted in injunctions against dumping debris into the streams and ravines, which had the effect of practically prohibiting all hydraulic mining. Opposed to the farmers and those interested in perfecting streams and adjacent lands, were the mining interests, which it has been estimated had over $100,000,000 invested in hydraulic mining previous to the restriction by the courts."

This condition, the commission says, led to the establishment of the California Debris Commision to regulate hydraulic mining and to protect the streams, preparing plans, also, to restore the rivers to the condition in which they are said to have existed in 1860, as far as practicable.

During the fiscal year preceding the date of the report, 43 permits to operate mines by the hydraulic process were granted by the commission. Of these only three were for Nevada county properties, two for Plumas county, one for Sacramento county, and the others on other watersheds. Nine permits were revoked in Plumas, eight in Sierra, five each in Nevada and Placer, and two in Yuba, out of the 69 total revocations, all of which

were owing to the abandonment of the mines. Thirty-nine licenses were suspended for various causes and 700 personal inspections of mines were made by the commission. Heavy freshets in the spring caused some dams to fail in part, and in these cases the operators were immediately compelled to cease operations pending the completion of the dams.

Three cases in Nevada county and one in Plumas were discovered of operations without a license, and procedings were at once taken in the United States courts The total amount of material mined under permits during the fiscal year, as shown by monthly reports made to the commission by operators of the mines, was 705,000 cubic yards.

Instead of co-operating with the American Mining Congress the mining people of Arizona have decided to organize a miners' association on their own account, Senator W. C. Ralston, an ex-president of the California Miners, Association and one of its founders, has this week gone to Phoenix to advise with the Arizona people on this subject.

Judging from the expressions in the Arizona press the territory is well nigh unanimous in its sentiment as to the need of a mining organization similar to that of California. The opinion is expressed by many mining men that if each State would follow this example, form local organizations to get the mining interests to act together and remove any existing jealousies, and impress upon their representatives in Congress the demand for the creation of a Department of Mines, it would be likely to accomplish more than hundreds of perfunctory resolutions passed at an annual meeting of the American Mining Congress.

The continued high price of silver is causing heavy shipments of Mexican dollars melted into bullion through this port, Seattle and Vancouver to the Orient. The shipments are being sent by Wells, Fargo & Co. from Mexican points under heavy guard in the express company's cars. It is said that during the past sixteen days $13,000,000 in silver bullion have been brought out of Mexico for shipment to the Far East from this coast. In financial circles predictions are heard that silver is going to 70c. because the surplus production is limited, while the mine officials state that during the past year it is estimated that 60,000,000 oz. have been shipped to the Orient. If silver should go to 70c., both the mine and local bank people state that the Philippine pesos and the so-called Mexicans would be more valuable than ever as silver bullion, and in the latter form would be drawn more than ever to the great trade centers of India, China and Japan.

Four of the largest sized gold dredges have been working during the latter months of the year in the Yuba river field, between Smartsville and Marysville, and two more were set in operation in December. Four more will be completed by March, making ten in this comparatively new field. They are all of exceptionally large capacity and are now digging to a depth of 60 to 62 ft., about double the depth common at Oroville, where most of the dredges are located.

At the last meeting of the Anti-Debris Association some of the dredging companies sent representatives and others sent letters on the subject of dredging in the Feather river, stating that at the present time all the dredges on the Feather river are "land-locked", and while in the past some had been operating in the river and some had allowed their dredges to comunicate with the river, at the present time no debris is entering the the stream. They stated they were perfectly willing to have a committee, of the association or any person they might select, visit the section where they were carrying on their operations, and would give them all the information in their power; and if any of their dredges was doing any injury they would comply with any suggestion the association should make to remedy the injury. After considerable discussion a committee was appointed, consisting of Supervisor E. J. White of Sutter county, Supervisor Morrison of Yuba county, and Supervisor Johnson of Sacramento county, who are to visit the dredges in question to see whether anything further is necesssary to be done to prevent injury to the rivers.

The Anti-Debris Association has also decided to have a board of management, consisting of members of the boards of supervisors of the counties contributing to the support of the association, and also to have an advisory board composed of not more than eight members from each county belonging to the association, to be appointed annually by the board of supervisors of the respective counties. It was decided to also have the board of management appoint one supervisor from each of the counties of Sacramento, Sutter and Yuba, and this committee should have full charge of all field work and have the exclusive power to employ all help in the field. As soon as practicable, men will be sent out in the field, and a complete survey of the whole hydraulic territory will be made and prosecution commenced against all who are in any way mining by the hydraulic process to the injury of streams.

The New York-Grass Valley mine, Grass Valley, Nevada County, is in financial difficulties, and facing a suit brought by its former superintendent and manager, George W. Root. He has commenced suit to foreclose a mechanic's lien against the property for $2,642 alleged to be due as balance on his salary, in addition to $250 for attorney's fees. This is not all of the corporation's troubles, however, as a number of unpaid miners are filing liens against the plant, having taken legal action yesterday. They claim $600 due them, in the aggregate. Edwin Fernald, secretary of the concern has returned from New York and states that it will not be long before the debts will all be paid off and the mine running again.

The Yreka Mining & Milling Co., owner of the old Gold Ball group of quartz ledges in Liberty district, Salmon river, Siskiyou county, near the Black Bear mine, has compromised with Thos. and Joseph Stephens in settlement for a $56,000 judgment rendered in the Superior Court some time ago. The Stephens Brothers accepted $40,000 for their claim and gave up their mine near the Yreka, including buildings, etc., when the latter turned the entire property over to the Califorina Consolidated Co., a new corporation organized under the laws of the State of Maine, with capital furnished by a Massachusetts syndicate. The new company in charge will soon commence operations on an extensive scale, by putting in electrical works and all the latest up to date machinery for saving gold. This claim paid well when worked for some time, or until stopped by a law suit for infringement on the adjoining claim. This adjoining claim is the Evening Star and Central, owned largely by John Daggett, of the Black Bear Mining Company.

Bisbee. Jan. 4.

The December production of the Calumet & Arizona mining company was 1,790 tons. This makes the year's production 35,000,000 lbs., for until November the mine did not make to exceed the rate of 32,000,000 lbs. per annum. During the year it has paid dividends of $1,700,000, three of $400,000 and one of $500,000, has spent $300,000 in betterments at the smelting plant, and a smaller sum in mine enlargements and machinery, and has added about $900,000 to its surplus. This now amounts to about $2,700,000. The annual report for 1904 showed it to be $1,823,000. It is generally believed among insiders that this company is to expand materially in the near future, that its policy is to be changed and that it will become a large holder of other mining interests. It is well known that when the various associated companies were organized, between 1902 and 1904, which now hold more than 1,400 acres of ground that has been proved valuable, the option on their lands were offered the parent company before new organizations were perfected and that the last of these offers was made upon the organization of the American Development Co., about two months ago, and several of the directors of the Calumet & Arizona were anxious that this land be taken by that concern, but others did not agree and the new company was formed. It is now seen that this was an error, and that American is of sufficient probable value to have been included. It was felt, however, that the Calumet & Arizona had enough work for a long time to develop

its claims and that the probability of value in the group was so great as to make it unnecessary to include anything else. But the rapid increase in earnings, the large surplus, the efficient organization and the frequency with which opportunities came up, has made it evident that these should be taken advantage of.

No ore is being hauled out of the Shattuck yet, contrary to expectations, and none will be till the Copper Queen has hauled down its old Uncle Sam stock, for which the steep and narrow road to the Shattuck only is available. The coming week the company should be hauling ore and getting it to the Queen furnaces at Douglas. This will make Shattuck a steady producer during 1906. Its work underground is very flattering still, and the new drift on the 700-ft. level toward the Leo and Roy claims is passing through much good looking ground.

Martin Pattison, of Duluth, Minn., has finally taken over the Apache group, near Hachita, and is working it with John E. Penberthy of this city in charge. Mr. Pattison is doing this on his own account. He may abandon it altogether, or he may later organize a company.

In the Lake Superior mine a new orebody has been cut in cross-cut No. 36, on the 1,000-ft. level north, and is averaging from 15 to 35% copper. At last reports it was in about 45 ft. and still going. The company is to drive on the 900, above this and other finds, in the hope of cutting the same ore there. Sinking of the Cole shaft on this property to the 1,400-ft. level is in progress and has now gone about 60 ft. The Hoatson shaft last week gained 36 ft. It is 850 ft. deep, in limestone. Occassional prophyry dikes are cut, and the appearance of the shaft is excellent. This company's Briggs shaft is bottomed for the present at 1145 ft. and their station on the 1130 is being cut as fast as possible. This shaft has been fortunate in going down all its depth in solid lime, and will be one of the best working shafts in the district. It is difficult to get shafts down here without cutting ore, and it is a fact that only one of the six large shafts of the Queen has gone to the bottom without being troubled by ore and soft ground during its progress.

The Radium Mines Co. has been organized at Globe, to take over a large tract of ground lying north of the Old Dominion smelter and on the west side of Pinal creek. There are some 60 claims in the ground, many of them producers of silver and lead in considerable quantity in the early days of that region, when hand work was the only way and when difficulties of getting ore out were so great that only the best could be mined.

Copper Queen is drifting from its Cuprite shaft west toward Shattuck, and will make connection along the trend of the Czar fault with the Shattuck shaft. The latter company is closing the purchase of a large rapid Nordberg hoist for this shaft, and expects to have it running during the present year.

This total copper production of Arizona should be increased materially during the coming year.

Socorro, N. M. Jan. 5.

Mr. J. H. Brittain of Los Angeles, representing New York capitalists, has secured a group of turquoise claims near Cerrillos, Santa Fé county, and will start operations soon. The deposit is said to be on the same dike as the mine of the American Turquoise Co. (controlled by the Tiffanys) and the new enterprise may prove a formidable competitor to the monopoly of turquoise production the latter operators have hitherto enjoyed in this district.

Socorro is the banner county of the territory in the value of its mineral shipments for 1905. This is chiefly owing to the output of Kelly, from which two mines, the Graphic and the Kelly, have alone shipped a million dollars worth of ore. The carbonates and sulphides of zinc, lead, copped, silver and gold are the values, with zinc far in the lead. The Graphic mine was brought two years ago by the Sherwin-Williams Paint Co. for $150,000; but is now valued at a much higher figure. This company also owns the Ozark Zinc Oxide Co., at whose works in the gas region of Southeastern Kansas the ore is burned for zinc pigment, the copper and precious metal residue being sold to the smelters.

The Tribullion Mining & Smelting Co. owns the Kelly mine, the shipments of which have recently fallen behind the Graphic, on account of hindrance to the stoping by extensive development work. An incipient boom is showing itself here; a New York company will shortly explore some ground it has bonded and it is likely that two San Francisco syndicates will soon take hold of some tracts. Kelly is suffering from a house famine, as there is scarcely any room for the numerous new miners, who have been lately brought in for the Graphic and Kelly mines. The added mining force will soon make itself felt in the ore shipments, which are now 4 to 6 cars daily.

In western Socorro county, in the Mogollon district, the Last Chance mine has developed an orebody 16 ft. wide and assaying high values, at the 600 ft. level. The Ernestine Mining Co. owns the mine and Ernest Craig is president and manager.

The Jarilla district in Otero county is active. The Excelsior Co. has recently struck 4 ft. of 4 % copper sulphides in its Nashville shaft. It is the intention of the owner of the Terro Oro to sink a shaft on the vein to strike the place where it crosses the Iron Hand lode, as good values should be found at the junction. The Jarilla Mining Co., a subsidiary corporation of the Southwestern Smelting & Refining Co., owns 3,000 acres in these mountains. The principal mine is the Lucky, the ore from which carries 5 to 6 % copper, $4 to $8 in gold, a little silver and an excess of iron; the developments reach to 300 ft. depth. Some rich gold placers claimed at the southern end of the range are also controlled by this company, but lack of water has hitherto prevented profitable operations.

Sierra county is coming to the front. A promising enterprise is that of the Southwestern Lead & Gold Co., which is developing a lode on the northwestern flank of the Cuballis range, near Engle. The property which was then in an undeveloped condition, was bonded about three years ago from W. H. Byerts of Socorro, and a little work showed up so much ore that it was quickly snapped up at the purchase price of $16,500. There is a coal bed a mile square on the plain to the northeast of the range and here an electric plant is being erected to transmit power (generated by the coal at the pit mouth) six miles for the use of the mine and the wet concentrating mill. The latter will have an initial capacity of 70 tons daily and will be completed within a few weeks.

Tonopa. Jan. 6.

The workings in the Belmont continue to look well. Some good ore has been opened up in the 500 ft. level.

The West End has shipped 43 tons of ore, averaging $44 per ton. The former shipment of 33 tons averaged $318 per ton. Latest developments in the mine are satisfactory.

The annual report of the directors of the Tonopah Midway Mining Co. states that 6,620 ft. of development work has been done on the property, opening up three veins. The full details of this work are given, and it is added that two of the veins are of milling grade. The third, known as the Brougher, was struck on the 365-level, and it has been proved up to the 265-level and down to the 490, and for 280 ft. on its course; from this work and various winzes and crosscuts the whole of the ore shipped by the company has been taken. Its width varies from 5 to 12 ft. "The mine is looking excellent, and there is a large amount of ore blocked out. We have been shipping about 70 tons a week, which will average $120 a ton. This amount of shipping ore can be increased at any time when thought advisable, but as there has been an advance in treatment charges, this increase has been deferred. There are 2,000 tons of ore on the dump, which will average from $30 to $35 per ton. The present shipments can be continued for a long time to come and, if necessary, can be increased.

"Total tons of ore shipped from which returns have been received, 1,872; gross value per ton, $119.70, making a gross value of $224,077. Cost of transportation and treatment per ton, $25.34, making net

value of ore $94.36 per ton. There have been shipped in addition about 120 tons which will net about $8,000."

Most of the Tonopah ore is unsuitable for amalgamation, and it is not a good smelting ore as it contains no "carriers." It is a dry antimonial-silver-gold ore with a quartz matrix. Numerous experiments have been made during the past two years to find the most suitable means of reducing it. The directors of the Montana and Midway companies favor cyanidation. By this process the ore would be crushed in a stamp mill, then concentrated and the tailings ground in a tube mill to a fineness of 150 mesh and then cyanided, experimental tests having recovered 93 per cent of the values. The ore will concentrate about 18 tons into one and the concentrates would be shipped to Salt Lake or treated by chlorination locally. The cost of this process would largely depend upon the capacity of the mill and the price at which electric power can be obtained on a long contract for a large quantity of horse-power, but it will certainly yield a good profit on $25 ore.

The new Manhattan field north of Tonopah continues to develop well. Several hundred claims are at present working and 50 are showing ore, some of which yield high assays. A regular stage is now running from Tonopah three times a week.

The Goldfield district is exhibiting much activity. The development of the mines is so satisfactory that legitimate operating capital is being attracted.

The last report of the manager of the Sandstorm mine states that rich ore has been struck in the company's workings on the 100-ft. level and also adds that about 15 tons of high-grade shipping ore is being sacked daily on the Loftus-Davis lease. On the Kendall, adjoining, high-grade ore is also being mined.

The Montgomery-Shoshone grubstake suit has been decided in favor of Montgomery and MacDonald, the original owners. This will be of much benefit to the district, which has not been prosperous lately on account of the principal mine being idle through litigation, and want of confidence in others which were expected to be involved in case of the Montgomery-Shoshone decision being otherwise than as stated above. The Montgomery-Shoshone Co. has now put a crew of men at work on this famous property, which has been tied up by litigation for the past six months. Over $100,000 worth of ore now sacked but previously held by the injunction pending against the property will be shipped.

It is reported that the Goldreed Co., Kawich, has cut at depth the sensationally rich ore-shoot that outcropped on the original discovery claim. The shoot was encountered on the 150-ft. level after considerable drifting had been done, and extends across the full width of the drift, carrying high-grade shipping values. The ore is now being sacked, and with that extracted from surface workings will be shipped out in a few days. The company, having proved its property to the depth of 150 ft., will at once put a large force of men on development work. This has given great encouragement to the many local people interested in the district, where there will undoubtedly be great activity this winter.

Denver Jan. 5.

Some years ago the Illinois Steel Co. discontinued the use of Leadville manganese ore and since then has secured its supply from South America and Russia, but the company has just contracted for 20,000 tons, with an option for 30,000 tons, with the management of the Midas Co. at Leadville, which expects to ship about 100 tons per day from the Gray Eagle

Mr. William A. Sproull, of the Cambria Steel Co., of Pennsylvania, is expected to be here in a few days to look over the tungsten field in Boulder county, which has been drawing some attention lately.

Mr. Geo. E. Roberts, director of the United States Mints, has just completed his official inspection of the Denver branch mint and coinage will commence in a few days of the $25,000,000 worth of bullion, which has accumulated there. About 100 people will be employed on the start.

The Stratton Cripple Creek Mining & Development Co. has just declared its first dividend of ¼c. per share, amounting to $50,000. This is a part of the Stratton estate, which, according to the executors, is in a very flourishing conditon, and as soon as all litigation is disposed of they expect to start the building of the Myron S Stratton home, as provided for in the will.

The earnings of the two principal railroad systems in Colorado during the past year, show a state of prosperity.

Rumors are current here that the American Smelting & Refining Co., has lately purchased large blocks of the $6,785,000 of additional capital stock of the Mexican Central Railway.

State Labor Commissioner Brake is at present trying to settle a strike at the Standard coal mines near Lafayette, where a walkout took place a few days ago.

Progress on the Denver, Northwestern & Pacific Railroad is being made in good shape, as thus far only little snow has fallen in the mountains. The preliminary work on the long tunnel through the main range has begun. It will take about three years to complete the bore.

Leadville Jan. 6.

The year 1905, just ended has verified beyond question that Leadville ranks first in the list of mining camps, and looks with pride at a total output of over $328,000,000. The total for the year 1904 was $11,708,812, and for the year 1905 it was $13,164,198, an increase of $1,455,386. The tonnage for the year 1904 was 742,775, and for 1905 it was 831,370; an increase of 98,595 tons. In the values of silver there was a slight falling off, of $66,179, and gold also fell off $39,030. To offset this there was an increase in lead values of $578,926; and in zinc of $661,536. The zinc mined was 159,747 short tons, against that of 105,300 tons in 1904. For a camp that has been mining strenuously for 27 years the record for 1905 is one of which the people of Leadville as well as of the State have reason to be proud.

The increase in tonnage and values is due to the amount of lead shipped from the new ore-bodies in the Coronado and the properties on Rock hill, and also the extra tonnage in zinc that came principally from the Moyer mine belonging to the Iron Silver Mining Co. This property shipped alone 142,800 tons of sulphides of lead, copper, zinc and iron, the greatest tonnage shipped in the United States by an individual mine.

The new territory to be explored during the year 1906 will greatly exceed that of 1905. The Tuscon shaft, belonging to the Iron Silver Mining Co., is sinking to catch the extension of the immense body of ore found in the Moyer, and as the diamond drill opened a body of ore 185 ft. thick it is fair to presume that the ore-shoot will be opened to its fullest. The Yak tunnel is now in a position to double its output, whenever the smelters are in a position to take the ore, and the same can be said of the operations at the mill. The Western Mining Co., will undoubtedly open the Coronado ore-shoot from its end-lines south to the Penrose. This body has been opened for 185 ft. thick, average 35 feet wide, and already 1,000 ft. long.

The most important work mapped out for the present year is the driving of a tunnel through Mosquito range from the head of Empire gulch in Lake county to a point in Park county a few miles above Fairplay. The tunnel will be about one mile in length, and will be 2,000 ft. below the apex of the range; it will pass through the mineralized zone on the Leadville side of the range, and will develop the mines in the Horseshoe district of Park county. Work will be started in the spring. The enterprise is being financed by the Westinghouse Electric Co., of Pittsburg.

Another enterprise that is looked upon with much favor is that of the Long and Derry. The property has been in litigation for the last 16 years, but fortunately this has been settled, and work on the old mine will be resumed sometime during the month. When the property was worked, over half a million dollars were taken out and still in the old workings are many thousand tons of ore that can be shipped to-day that could not be when the property was worked, on account of the low grade of the ore. Ball mountain, at the head of California gulch, is another

section that will receive a great deal of attention during the year, as the ore found in the Sunday mine proves that the district contains large bodies of ore. The section at the head of Iowa gulch, where the Continental Chief is located, will undoubtedly be a busy one during the spring and summer months, as the amount of ore shipped from the Continental Chief has given the different owners of ground in that section faith that the ore-shoot of the Continental Chief extends both north and south.

Salt Lake City. Jan. 6.

The Mammoth Mining Co. has brought suit in the Federal court against the American Smelting Co. to collect a claim aggregating $72,000 alleged to be due through the misinterpretation of an old contract under which copper ores were shipped. The matter has been in dispute for several years.

It is believed here, although it has not been authenticated, that Charles M. Schwab is interested with a number of prominent Ogden citizens in the construction of the proposed smelter about 10 miles north of that place. The plant is to be operated by the Utah Smelting Co., which has filed its articles of incorporation with the proper authorities. The capital stock is $500,000, divided into shares of $100 each. One-half the capital stock has been subscribed by Ogden citizens and the balance by New York parties. David Eccles, of Ogden, is the president of the new corporation. Some of the contracts for structural equipment and machinery have been let. The initial unit, it is stated, will handle 200 tons of ore per day. The Ogden & Northwestern railroad, a steam line now operated between Ogden and Hot Springs, is to be extended to the smelter site and equipped electrically.

The Potosi mine at Good Springs, Nevada, has been sold through Salt Lake parties to a Duluth syndicate, for a consideration approximating close to $150,000.

Walter C. Orem, manager of the Utah Apex and New Red Wing mining companies, operating in Bingham, has for himself and associates, secured a controlling interest in the Butler Liberal mine in Markham gulch, Bingham. Options have been taken on other adjoining property and the whole will probably form the basis for the organization of another strong company.

Much local interest is being manifested in the outcome of the conferences that have been in progress in New York during the past few weeks between representatives of the American Smelting & Refining Co. and Samuel Newhouse which are likely to result in the taking over of control of the Boston Consolidated and Cactus mines, the former in Bingham and the latter in Beaver county, operated at the present time under the direction of Mr. Newhouse. In connection with this deal, it is believed that the smelting interests are about to organize a large holding company that will rival the Amalgamated Copper Co. in importance.

Scranton. Jan. 8.

The record of the anthracite region was broken by the production of the Woodward colliery of the Lackawanna Co. at Plymouth last year. The total output of the colliery for the year reached 1,005,235 tons, out of which 954,721 tons were shipped to market, and 50,514 tons were used as fuel at the colliery. As far as can be ascertained no colliery in the world has ever produced such an enormous amount of coal in one year. The officials of the Coal Department of the Lackawanna railroad began the year 1905 with the determination of breaking the record, being prompted to do this by a friendly rivalry with the officers of the Lehigh Valley Co., who pin their faith on the Prospect breaker, which for years carried the pennant of the anthracite region. This is the second occasion upon which the Woodward has hopelessly passed the Prospect. The contest was closely watched by the officers of all the coal companies and not a little money was wagered on it early in the year. Nothing was spared by the Lackawanna officials to assist in making the record. There were always plenty of cars, and the men were urged to work every possible day, and as many men as possible were placed at work. The most remarkable feature of the record is the fact that the breaker was designed and built with a capacity of 2,000 tons per day only, while the actual work of the year shows that if it was in operation each working day the average output would have been about 3,300 tons per day. As a matter of fact, so much time was lost owing to holidays and repairs that the average output was more than 4,000 tons per day or twice the supposed maximum capacity. The breaker was built in 1887 and in the first year broke 35,387 tons of coal, which was at the time regarded as marvelous, taking into consideration that the machinery had scarcely got into working order. Five years ago, under the old administration, it reached 335,495 tons, the last year of the old order, and it was then the champion breaker of the Lackawanna. In 1904 these figures jumped up to 745,163 tons, finally reaching 954,721 tons. The ambition of the department is that the breaker will break 1,000,000 tons this year. There are 1,287 men and boys employed in side the mine and 273 outside.

The Eddy Creek breaker, of the Delaware & Hudson Co., which was built for a capacity of 1,000 tons a day, last year turned out 500,000 tons in 244 days, averaging 2,073 tons for a nine hour day.

The Lackawanna Co. will open the old Davis mine in Scranton, which was abandoned 18 years ago.

The strike of the miners in the Abbot vein of the Buttonwood colliery, which originated twelve months ago, has been brought to a close and the men resumed work on Monday, having been given an advance of 5½ %. When the vein was opened a year ago, and the miners began opening the new chambers they claimed that the pay was insufficient. Rather than increase the pay the company closed the vein for the time being.

An important deal, took place in Pottsville on Saturday, when the Borie, otherwise known as the Broad Mountain, coal-lands were sold at public auction for the sum of $260,000 although a few years ago the sum of $2,500,000 was offered for the same property and refused. The lands comprised 19 tracts with a total of 13,000 acres. Recently the lands were mortgaged to E. P. Wilbur, formerly president of the Lehigh Valley Co. for the sum of $400,000; he foreclosed the mortgage. The actual debt was $250,000 and eccrued interest, the sum of $150,000 having been realized by the sale of bonds which were held as collateral security. The lands have never been thoroughly worked, although numerous prospecting operations have been carried on. Until recently the Borie people were prominent bankers in Philadelphia when they closed their banking house and retired from business. The lands are the most extensive of any in the anthracite region that have not yet been thoroughly developed, and if it were certain that the coal deposits were up to the standard they would bring a fabulous price as coal property.

The price obtained on Saturday was small compared with previous offers. It represents $20 an acre, when the sum of $200 was previously offered and refused. The surprise was enhanced when it was known that other lands adjoining have recently been purchased by the Schuylkill Coal & Iron Co. for $1,000 and even as high as $1,500 an acre. The purchaser was Atttorney Cummings, of Pottsville, who declined to give the name of his client, stating that it would soon be made public. It was reported that the purchase was made for the Lehigh Valley Co., but Superintendent Warriner informed the correspondent of the JOURNAL that this was not correct. The probability is that the Schuylkill Coal & Iron Co. is the purchaser, although there are some who are confident that the Philadelphia & Reading Co. is desirous of adding to its undeveloped lands.

Victoria, B. C. Dec. 20.

Notwithstanding that, pending the completion of plant and buildings to replace those destroyed by fire several weeks since, the St. Eugene mine has not been shipping ore, the Hall Mining & Smelting Co.'s smelter at Nelson received 1,090 tons of lead-bearing ores containing 297 tons

of metallic lead. The chief shippers were:

Mine.	Mining Division.	Lb. Ore Shipped.	Lb. Lead Contained.
Alice	Nelson	145,655	94,245
Arlington	Nelson	218,967	10,221
Cork	Ainsworth	81,072	41,460
Emily Edith	Slocan City	80,678	44,615
Hewitt	Slocan	194,384	11,681
Highlando	Ainsworth	188,695	42,079
Krao	Ainsworth	225,581	25,708
La Plata	Nelson	147,214	26,652
Payne	Slocan	61,200	38,348
Reco	Slocan	77,912	45,138
Whitewater	Ainsworth	131,819	54,078
Ymir	Nelson	192,444	13,114

Several of the silver-lead mines shipped concentrates. The Arlington (Erie) and Ymir mines produce gold-quartz ores with but small lead contents.

G. O. Buchanan, of Kaslo, president of the Associated Boards of Trade of Eastern British Columbia, which includes the portion of the province in which are most of its chief mining sections, has issued notice of intention to hold, at Cranbrook, East Kootenay, about the middle of January next, the eighth annual convention of the affiliated boards. Among the subjects directly affecting the mining industry previously before the delegates from the affiliated boards, but in regard to which the executive of the association has not yet taken action, are the following: Establishment of Dominion department of mines; purchase by Government of gold and silver bullion; recommendation to Provincial government of a substitute for the existing 2% mineral tax. Other subjects not finally disposed of are: Request for increased customs duties on certain lead products, and proposed eight-hour law for smelters. Matters dealt with by the last convention include: (1) Bounty on copper, advocated by Rossland delegates but not approved by majority of delegates of other boards—consequently the request was not presented by executive to Dominion government. (2) Increased duty on corroded lead—request for same fully complied with by Dominion government. (3) Commission to investigate zinc resources of province and treatment, etc., of zinc ores—commission appointed and now acting.

The British Columbia Copper Co. has made public its intention to greatly enlarge its smelter, of which J. E. McAllister is manager. It is stated that a contract has been entered into with the Power & Machinery Co., of Cudahy, Wis., to supply three blast-furnaces of a capacity larger than any copper furnaces at present in Canada. The hearth area of each furnace is given as 48 by 240 in., and the treatment capacity 500 to 600 tons per diem. Furnace charging will be from side dumping cars hauled by electric locomotives. Molten slag will be hauled to the dump in 25-ton cars, also by electric locomotives. The slag cars will be supplied by the H. M. Treadwell Co.; each will have an electric motor for tilting the car. The three large blowers for the furnaces will be Roots' blowers, each driven by a 300-h.p. induction motor. A 100-kw. motor generator and several smaller motors will also be installed at the works. Five trolley locomotives will be employed in hauling ore to the furnaces and slag to the dump. Ore bins will be enlarged, a larger railroad weigh-scale put in, a machine shop with full equipment of power and hand tools provided, together with all accessories requisite to make the smelting plant modern and complete. The new furnace building will be constructed of steel. A new pumping plant will be obtained from the Canada Foundry Co., of Toronto, Ontario. At the company's Mother Lode mine electrical power will be substituted for steam for driving the 30-drill air-compressor. For this purpose a 500-h.p. induction motor will be installed. The big ore crushers at the mine will also be electrically driven in future. A new pumping plant will be obtained from the Canada Foundry Co., of Toronto, Ont. All the electrical machinery and apparatus, including generators, motors, and three 50-kw. step-down transformers at the mine, will be supplied by the Canadian Westinghouse Company.

London. Dec. 30.

With copper so high in price, we might expect a revival among promoters, and the issue of good, bad and indifferent prospectuses, as was the case during the copper boom six years ago. So far, however, the new issues brought before the public have all been in the hands of responsible people, who have been searching for several years for new supplies of copper, rather than for new properties that can be used for stock exchange gambles.

One of the new companies launched during the past week or two is the Mitterberg Copper Co., which has been formed to acquire the properties of the Mitterberg Kupfer-Gewerkshaft, situated at Bischofofen in the Austrian Tyrol. This is a property that has been worked for some years on a comparatively small scale and there is every reason to believe that it will pay if developed on a large scale. There are over 400,000 tons of ore ready for stoping, an equal quantity of probable ore, and 3,000,000 tons of possible ore, all estimated at about 3% of copper. Mr. Robert Addie, who makes these estimates, is a careful man and we may take it that much of his "possible" ore can be counted on as "probable" ore. I may state that the shares are being well taken up in England and France.

Another new copper flotation is an issue of shares by the Mining Exploration Co., which was formed five years ago to acquire properties in the Argentine, just on the borders of Chile; there are two properties, adjoining, named respectively the Victoria and Las Choicas, and they are 60 miles by road from Tinguiririca on the Chilean State railway. There is a large amount of ore mining 8%, and it is intended to erect concentrators and smelters, so as to treat 30,000 tons a year. For this purpose an issue of 105,000 shares of £1 each being offered for subscription. The mining operations are under the direction of Mr. William Rich, who was for many years the manager at Rio Tinto.

While writing of copper companies, I may mention the case of the Copiapo Mining Co., which has worked mines in Chile since 1836. Though a regular producer, the company has never paid substantial dividends and one difficulty after another has had to be contended with. During the year ended June 30 last, 9,215 tons of ore averaging 14½% were treated, at a profit of £16,000. After deducting all other expenses the net profit to the company was £5,300, which is to be carried forward. A section of shareholders, led by Mr. Ludwig Loeffler, came to the conclusion that it was time a change was made in the directorates and management, in the hopes of a change of the business. At the general meting of the shareholders therefore, the re-election of Messrs. Holland and James to the board of directors was opposed, and Mr. Loeffler and Mr. Nicol Brown appointed in their places. As a result of the vote. Mr. Anthony, another director, felt it desirable that he should retire also, and leave the control entirely in the hands of Mr. Loeffler and his friend. Mr. James belongs to the firm of James & Shakespeare and Mr. Anthony to Henry Bath & Son, both well-known firms of metal merchants; Mr. Holberton is an experienced manager and it is not quite clear that the new board and management will do any better. It is only fair, however, to let other people have a go at the subject, in hopes that something more favorable may turn up. It may be mentioned that Mr. Loeffler is connected with the firm of Siemens and holds extensive interests in a number of copper properties.

El Oro Mining & Railway Company working at El Oro, Mexico, has formed a subsidiary company called the Somera No. 1 Co., to take over the property of that name and work it independently. The property was originally bought, five years ago, for £155,000 in cash, because El Oro veins were making in that direction, and since then £63,000 has been spent in developments. The development work has proceeded so well that it was felt to be advisable to work the property concurrently with the El Oro. It would be inexpedient to spend any more money on it out of revenue, for such large amounts from this source have been spent on reorganizing El Oro mine itself during the past two years. It was therefore decided to form a subsidiary company and to transfer the property to it for 234,000 shares of £1 each and at the same time offer 216,000 shares for subscription. By this management the payment of dividends by El Oro will not be interfered with.

General Mining News.

Lewisohn Mining & Exploration Co.—This company has filed articles of incorporation in New Jersey. The capital stock named is only $5,000, but it is said that this will be increased to $50,000,000. No particulars are given out concerning the company, but it is understood that it will be a holding company, taking over the shares of various mining companies. The plan of operations, it is said, is similar to that of the Guggenheim Exploration Co., but it will deal chiefly with copper propositions.

ARIZONA

SANTA CRUZ COUNTY.

Mowry Mines Co.—This company informs us that on Dec. 18 it shipped to New York the first car of bullion from its new smelter, at Mowry, which has just been completed and blown in. This shipment was 32 tons, worth about $156 per ton. The Mowry ores carry lead, silver and gold, running approximately 20 % lead, 20 oz. silver per ton, and some gold. By April the company expects to be producing from 18 to 20 tons of bullion per day. In the early sixties these mines were operated by Lieutenant Sylvester Mowry, and during a period of about four years he took out of the mines upwards of $1,500,000. Mowry's operations were carried on to a depth of 260 ft.

In June, 1862, Mowry was arrested by Gen. J. H. Carleton, of Fort Crittenden, under a charge of furnishing lead to the Confederacy. He was imprisoned at Fort Yuma, later tried, and his property confiscated by the United States Government. For several years thereafter it was impossible to operate the property because of danger from the Apaches. In the eighties the property was taken up by the prospectors, and later purchased by San Francisco and Tuscon people. It has been re-opened, equipped and put into operation by them, under the supervision of Mr. J. N. Curtis, mining engineer. During the past two years the orebody in which Mowry operated, has been developed to the 400-ft. level, a large tonnage having been opened. The property is equipped with modern machinery, a concentrating mill, and a 100-ton smelter.

CALIFORNIA

Business generally through the year has been less prosperous in the fuel line than most other lines of trade; not that the quantity consumed is of diminished amount under last year, but fuel oil has controlled the situation.

ELDORADO COUNTY.

Coloma Gold Mining Co.—This company has been organized to work a mine by that name in Coloma Canon below Georgetown. A roller mill, rock breakers and concentrators are being put up. The water power is to be taken from the ditch of the Loon Lake Water & Power Co. at the Taylor mine reservoir, and conveyed in a pipe line 7,000 ft. long.

FRESNO COUNTY.

The Copper King copper mine at Clovis, which got into such serious difficulties a few years ago that it had to be closed down, seems to be proving itself of value after all. The trustees of the creditors have been working away and shipping ore, so that nearly all the preferred claims have been satisfied, and a payment of 10% on the ordinary claims will shortly be made. The creditors have instructed Trustee George Ade to sink the shaft 200 ft. deeper to develop more ore; and a good deal of ore is being taken out and shipped to the smelter. The debt which yet hangs over the property is about $500,000, but those most competent to judge say that the mine should pay out of debt, and be returned to its stockholders within two years. Today there is $78,000 in the banks, $35,000 worth of ore at the smelter in Tacoma, Washington, and a considerable quantity of ore in transit.

KERN COUNTY.

It is expected that shortly some of the mines around Havilah will start up under good auspices. The Confidence Company, composed of Los Angeles county men, has elected new officers, and taken in several more claims which have at one time been good producers.

MARIPOSA COUNTY.

The new Yosemite Valley electric railroad is expected to become quite advantageous to the mining industry of Mariposa county, as machinery and supplies will be brought in more cheaply than at present. Among the mines to be directly benefited as being near the line of the road are the Exchequer, on the Merced river; the Washington, No. 9, No. 8, Pool, Quartz Mountain, Mount Gaines, Enterprise, Campodonico and a dozen others. It will now be possible for them to use electric power, thus reducing expenses materially.

NEVADA COUNTY.

Work has commenced on a rich gravel mine west of Grass Valley, by the Prospectors' Co. They have bonded the old Alta Claim from I. Haas and I. Stein, and will proceed to develop it to the utmost. Two years ago this ground was bonded by an organization which spent all of that time in running a tunnel in 600 ft. through the hardest kind of rock. When gravel had been encountered, prospecting fairly well, the company's finances gave out and it was forced to give up, as its bond was about to expire.

Gold Flat Consolidated Mining Co.—Eastern people have been writing to California as to the standing of this company, and Nevada county papers have expressed themselves as rather doubting the legitimacy of the operation. It seems that the mine was worked some years ago and made a good showing. It is owned by Weissbein Brothers, who have formed a company to re-open it and develop the property. It was the new name which puzzled local mining men. It is understood that Mark B. Kerr, who was superintendent of the W. Y. O. D. mine at Grass Valley during the time it was operated by the Weissbeins, and still later of the Jumper in Tuolumne county, will have a similar position with the new company. The property consists of two patented claims near the summit and the railroad running through the ground. Both of these claims have been consolidated under the name stated above. A double-compartment shaft is now down to a depth of 370 ft., at which depth good ore was taken out when the property was last worked under the foremanship of W. P. Martin. It is stated that a company of "tributors" took out 880 tons of ore at that time, which averaged $10 per ton. Disagreement among them as to methods of operation caused the property to shut down, something like ten years ago. Now, Joseph Weissbein, of San Francisco, a former banker and mine-owner of Grass Valley, has associated eastern capital with him in the enterprise, and organized a com- which is incorporated under the name of the Gold Consolidated Quartz Mining Company.

SAN DIEGO COUNTY.

Julian Consolidated Reduction Co.—This company's plant at Julian has commenced operations. The plant is established for the purpose of handling the refractory ores of the Julian section. It has been in course of construction for the past year and cost about $100,000. The plant will handle about 100 tons a day, and will take care of ores that have hitherto resisted other processes. There is plenty of this ore in sight, and the completion of this plant is expected to add much to the value of the adjacent mines.

YUBA COUNTY.

Although the supervisors have agreed that this county shall again become a member of the Anti-Debris Association and join with Sutter and Sacramento Countes to pay $200 a month each to its support, there may be a contest before the measure is finally adopted. A prominent tax-payer has openly stated that he will enjoin the county to prevent payment of funds to the support of the association. Many Yuba people have been satisfied to let the association alone, and they state as their reason that the United States Government, would take care of the debris problem much more energetically and satisfactory than does the association.

COLORADO

TELLER COUNTY—CRIPPLE CREEK.

The outlook at the beginning of the year 1896 for mining is quite bright

in this district. The possibilities for the settlement of the difficulties of the two factons of the stockholders of the Golden Cycle Co. are quite bright. The Hull City placer, which is in the vicinity of the Cycle property, has been recently purchased by Mr. J. T. Milliken, of St. Louis, who is the heaviest stockholder in the Golden Cycle. A deal is under way whereby the Hull City placer is to be turned over to Messrs. Carleton and Campbell, who are the principal minority stockholders in the Cycle and these gentlemen in turn will sell their holdings to the Milliken people. Should this deal be consummated it will put an end to the litigation between the two factions of the Golden Cycle. It is understood that Mr. Milliken paid about $400,000 for the Hull City placer, but it is not known just what the deal for the exchange of the Cycle stock is. Should the deal go through, which seems very likely at present, it is understood that the Hull City placer will be divided up between the Vindicator Consolidated and the Findley Company, which adjoins it on both sides. Mr. F. J. Campbell is one of the principal stockholders of the Vindicator and Mr. Carleton owns control of the Findley. If the deal is not made litigation will undoubtedly ensue, as it is said that large bodies of ore have been taken from the placer by both the Findley and the Vindicator.

The Findley Co. paid its usual dividend this week as well as an extra one. Dividends to the amount of $200,000 were paid last year.

The fight for the control of the Acascia is still going on, with the odds apparently in favor of the present management. A new and strong company has acquired the lease on the south end and are pushing the sinking of the shaft vigorously.

A number of claims were jumped the first of the year, though very few were in the producing area.

ILLINOIS.

United Coal Mining Co.—This company has been organized with headquarters in Chicago, and the following officers: C. M. Moderwell, president; Arthur L. Alias, F. J. Urbain and Harold Eldredge, vice-presidents; Lucius Teter, secretary and treasurer. The company has taken over the property of the Mecca Coal & Mining Co., which owned and operated two mines at Mecca, Parke County, Ind., where a new shaft will be sunk by the new owners next spring. The company owns there 1,300 acres of land and produces semi-block coal. The United Co. also owns 1,900 acres of coal land in Franklin north of the Zeigler mine.

OKLAHOMA.

LOGAN COUNTY.

Kentucky Coal Mining Co.—This company has been incorporated with $2,000,000 capital stock, and headquarters at Guthrie. The object is to develop coal land in Oklahoma. The directors are G. V. Pattison, L. E. Pentecost and H. W. Pentecost, Guthrie; Charles A. Baker, Indianapolis, Ind; I. R. Sawyer and N. M. Metz, Dayton, Ohio.

PENNSYLVANIA.

ANTHRACITE COAL.

Philadelphia & Reading Coal & Iron Co.—The financial report for the five months of the fiscal year from July 1 to Nov. 30:

	1904.	1905.
Earnings	$13,205,561	$14 678,261
Expenses	12,326,886	13,747,753
Net earnings	$878,675	$930,508

The increase of $1,472,700 in earnings was accompanied by an increase of $1,420,867 in expenses, leaving only $51,833 gain in net earnings.

SOUTH DAKOTA.

LAWRENCE COUNTY.

Branch Mint Mining Co.—James Hardin, of Deadwood, manager of this company, states that the three miles of track from the mine to the mill will be finished Dec. 15, and that miners will be put to work in the mine Jan. 10; and the 120-stamp cyanide mill will go into commission by Feb. 15. This company is developing the old Union Hill mine on a large scale.

Reliance Co.—This company has submitted a proposition to its stockholders to raise $60,000 for a 200-ton cyanide mill, to be erected early in the spring. Already half of this amount has been subscribed. The Allis-Chalmers Co., of Milwaukee, has furnished designs for the mill.

Monarch.—Shipments of ore have commenced from the Monarch mine, in Spruce gulch, to the new Ogden mill in Deadwood, which will go into commission in a few days.

Homestake South Extension Co.—This company has its new shaft on the Homestake vein down to a depth of 75 ft. Stringers of ore have commenced to come into the shaft.

Spruce Gulch Mining Co.—Gus Kellar, of Deadwood, has organized this company and will develop a property in the Lexington Hill district.

Homestead Extension.—This company has just opened up a body of ore containing free gold. The rock was found next to the foot-wall in a green talc formation and is believed to be a part of the side of the vein. The tunnel is now in 1,485 ft. and the orebody has been explored to the width of 420 ft. It is believed that ore can be mined and milled at the cost of 80 c. a ton.

Horseshoe.—The meeting of the directors of this company will be held at Pittsburg, Jan. 11. Manager W. L. McLaughlin and J. V. N. Dorr will attend the meeting. Mr. Dorr has submitted plans for the remodeling of the Pluma mill which will probably be accepted.

Big Four.—A force of men has been put to work after an eight months' shutdown and preparations are being made to unwater the shaft. It will take some time to complete this work. The pump can handle 200 gallons a minute.

Lundburg-Door Mill.—Another sand-tank will be added to this mill which will increase its capacity from 100 to 125 tons of ore per day. This mill is treating a large amount of custom ore and has been so successful that its construction is being copied by several other cyanide plants in course of erection.

Ryan Fraction.—John Hawgood, has been working this property for the past two months and has completed the work of clearing out the north drift at the bottom of the 70 ft. shaft. He expects to begin shipping ore in a few days. It is ore that was not handled when the mine was worked several years ago, because of its low grade, but now, with cyanide mills available, it can be handled at a good profit.

Victoria Mine.—This company expects to put into operation in a month's time its 200-ton cyanide mill. This is one of the most complete and best equipped plants in the Hills.

PENNINGTON COUNTY.

Montezuma.—A compressor-house has just been erected and a four-drill air compressor is now being installed. The main tunnel has been run for a distance of 250 ft. and will be extended 200 ft. further, where it will cut the main vein some 350 ft. from the apex. This property has been financed by capitalists from Troy, New York.

UTAH.

BEAVER COUNTY.

Frisco Contact.—A station has been cut at the 450 level of the shaft and a crosscut will be started to the Horn Silver vein, which cuts through the property.

Talisman.—This property is shipping to the Salt Lake smelters again.

Majestic Copper.—A desultory campaign of exploration is being carried on.

BOX ELDER COUNTY.

Century.—P. W. Madsen, of Salt Lake City, has decided to continue development work in the mine until about April 1, when the mill will be placed in commission.

BOX ELDER COUNTY.

Century.—P. W. Madsen, of Salt Lake City, has decided to continue development work in the mine until about April 1, when the mill will be placed in commission.

JUAB COUNTY.

Star Consolidated.—Development work is progressing with encouraging results. The 450 and 800 levels are looking particularly good.

Lower Mammoth.—On the 1,500 level the orebody encountered sometime ago is holding out and regular shipments of ore are being made.

Gemini Mill.—The starting of this plant has been delayed on account of the failure of the equipment to arrive as expected. The building is completed, but the plant will probably not be ready for commission until about April 1.

SUMMIT COUNTY.

Daly Judge Mill.—This plant is in commission again after being idle for about two years. For two years the company has carried on development in the mine, which has resulted in opening up some extensive bodies of ore in new territory and proving up ore at a depth in the older portions of the property where zinc has been replaced by silver and lead.

Comstock.—The management of this property, after years of diligent effort, has decided to close it down—possibly for good.

VIRGINIA.

FAUQUIER COUNTY.

North Virginia Exploration Co.—This company at Broad Run has commenced the sinking of two shafts on two of its properties. Development work will be carried on all winter, weather permitting.

WASHINGTON.

WHATCOM COUNTY.

Great Excelsior.—It is now made public that a deal which has been pending for some time, involving the future management of this mine in the Mount Baker district, has been consummated. The details proved for a transfer of the controlling interest in the enterprise to one of the smelter plants in British Columbia. The deal carries with it a consideration of $250,000, and the announcement is made that the actual transfer will be made during the coming year and that the new owners will provide for developing the property on an extensive scale. As development has progressed during the last three years, it has been found that the lower grade of ore is very silicious, which makes it useful for fluxing purposes, independent of the mineral values which it contains. It is reported that the ores which the smelter has been purchasing for flux are nearly exhausted. The smelter-men have visited most of the mining camps of British Columbia and Washington, and have found the low-grade ore of the Great Excelsior suitable to their requirements. As a result negotiations for the acquisition of the property were opened with the larger stockholders. In connection with the announcement of the transfer, it is given out that extensive improvements will be made on the property. The stamp mill will be enlarged and a railroad constructed from Glacier, in British Columbia, to Excelsior, where a connection will be made with the Bellingham Bay & British Columbia railway. It is estimated that the daily shipments of ore as soon as the railway is completed can be brought to 300 tons. The high-grade ores in the property will be concentrated at the mine, and for this purpose the plant now on the ground will be enlarged.

WEST VIRGINIA.

The Coal & Coke Railroad has been finally completed and opened for traffic from Elkins to Charleston, a distance of 180 miles. The new road runs from Elkins, 8 miles over the tracks of the West Virginia Central. Two short local coal roads were absorbed by the new line, and about 100 miles of new road built. The purpose of this new road is to develop large bodies of coal land owned by Messrs. Davis, Elkins and Kerens in Randolph, Upshur, Lewis, Braxton and Gilmer counties, where they are said to hold tracts aggregating 200,000 acres. The development of this region will require the construction of several branches from the main line.

MERCER COUNTY.

Coaldale.—Twenty-one miners were killed by an explosion in this colliery at Caoldale, 8 miles north of Bluefield, West Virginia, on Jan 4. The disaster was one of the worst ever experienced on the Pocahontas coal field. There were about 150 men at work in the mine at the time of the explosion, but most of them reached the surface safely by rushing to the entry before the gases filled the mine. The seat of the explosion was about 800 ft. back from the pit-mouth. Many of the miners who escaped with their lives were injured by being hurled against the mine walls by the force of the explosion. This explosion is the third in the Pocahontas coal field within six months, and the loss of life is much greater than in the preceding accidents.

Mine Boss Williams, who, at the time of the explosion, was in the main entry, and nearly a mile from the Cracker Neck portion, suffered from the concussion, and was almost overcome by the dust and gases before he could reach the east drift mouth. The greater number of victims were working some little distance from the point where the explosion occurred. These were suffocated. Those working in the Cracker Neck, or in Room 11 of this portion, were terribly mangled. The damage to the mine is heavy, and it will be some time before the wrecked section can be used. The majority of the miners were negroes from the eastern portion of Virginia, and were the oldest miners on the field. The Coaldale was the first mine opened up west of Elkhorn tunnel. It is in the 12-ft. vein of Pocahontas coal, and is considered the best-paying operation in the field.

Foreign Mining News.

MEXICO.

S. Pearson & Son have four pumping oil wells, and are constructing large tanks at the port of Coatzacoalcos, from which point they will furnish oil for the engines of the Tebuantepec National railroad. Likewise the Mexican Oil Fields, Ltd., has contracted to furnish oil from its wells at Ebano, State of San Luis Potosi, to the Tampico branch of the Mexican Central. Five engines of the latter company are being changed over to oil burners by the Thos. McNeil Co., of Pittsburg.

SONORA.

Swansea.—Ronquillo Copper Co. will commence work on the Swansea mine. The mine lies in the heart of the district in which the Cananea Consolidated Copper Co. has its property.

Todos Santos.—F. W. Foster, who owns a number of claims, including the old Todos Santos, near the Yaqui river, south of Nacozari, says that he is prepared to commence work and will erect a smelter about two miles from the mines. The Todos Santos has not been worked for over a hundred years. There are the remains of a town of several thousand people at the mine, and there are many thousands of tons of ore on the old dump.

San Pedro Mine.—The Moctezuma Copper Co. has made a new strike in the tunnel which is being run to cut the vein, and locks have been placed on the tunnel entrance to protect it.

Tavatachia Mine.—Remarkable ore is being taken from the 200-ft. level of the mine, in the Nogales de Carissus district, west of Nacozari. One piece of the ore weighing over a ton is on exhibition at the mine. It carries over 700 oz. of silver and 25% copper.

Cananea Eastern.—Having reached a body of black sulphide, carrying ore values, in the main tunnel, the management have stopped work at this place, deeming the black sulphide sufficient indication of the orebody. A new tunnel has been started lower down the mountain and is expected to meet a shaft which will be driven from the center of the surface orebody.

Ronquillo.—The Ronquillo Copper Co. is pushing the work steadily on its mine, the Ronquillo, four miles south of Janoverechi. A double-compartment shaft will be sunk. The main shaft is steadily being sunk, and the vein is expected at the 100-ft. level. Sinking will be continued until the 500-ft. level is reached, and laterals will be run at every 100 ft. The main cross-cutting work and stoping will be done at the 300-ft. level.

White Hawk Mine.—A 12-in. vein of gray copper, carrying high silver values

was run into at the 50-ft. level of the Mormon shaft. A 20-in. vein of lead carbonate was encountered in the Kid shaft at the 40-ft. level.

ASIA.

CHINA.

It is reported that all the mines near Liaoyang, Tehling, Feng Huangchen, and other places in Manchuria, have been worked lately by the Japanese. It is said that a number of Japanese engineers are surveying the mineral resources of that country.

A French syndicate, which holds a valuable lead-mine concession in Kwangsi province, has asked permission of the governor to resume operations, which were stopped on account of the rebellion.

A rich gold mine is reported to have been discovered in the Loo Loong district of Wing Ping prefecture, Chihli province. So abundant is the gold that a party of 30 miners is reported to have obtained 1,300 oz. of gold from alluvial washings in ten days. The Government has taken possession of the find, which (it is said) will immediately be worked on an extensive scale.

Sir John Lister Kaye has obtained an important concession in the Province of Anhui, where a deposit of iron ore is said to exist, distant only 3½ miles from the Yangtze river. The concession is granted for a period of 60 years, with a possible extension; the total area of the concession is about 50 sq. miles. It is estimated that there are 6,500,000 tons of iron ore developed, and that, if smelters are erected, 1,830,000 tons of pig iron can be made from 5,500,000 tons of selected ore. Mining engineers are now at work developing the property.

INDIA.

The gold-bearing quartz veins have been found in the Himalaya mountains which assay 5 dwt. per ton, but the difficulty of transporting the necessary mining machinery over the hill-roads would appear to be almost insuperable.

A Bombay firm has acquired the right to work claims in the Southern Mahratta country, in which manganese ore is found in, it is believed, paying quantities.

The first by-product coke-oven plant to be established in India is to be installed at the East Indian Railway Co.'s collieries at Giridih, for which an English firm is executing an order for the required plant.

BURMA.

The Burma Oil Co. recently struck a fine spouting well at Singu. The column of oil shot right out of the rig head, but was soon got under control. It is by far the most prolific well yet bored in Burma and it is expected to yield about 30,000 bbl. of petroleum per day.

AUSTRALIA.

QUEENSLAND.

The Etheridge mining field embraces an area of about 16,000 square miles, in which many valuable deposits of gold, silver, copper, tin, lead, iron, wolfram, molybdenum and bismuth have been found. Some parts of the Etheridge, such as the Einasleigh, where the copper company of that name has its property, and Ortona, are chiefly noted for their copper lodes, while most of the other parts of the field carry a percentage of lead with the gold and silver. These ores are generally refractory, and require special treatment to extract the gold therefrom. Most of the rich ores contain a percentage of lead and copper, and run to an average value of from $40 to $60 per ton. But these ores are practically valueless at present, owing to the large expenses incurred in carrying to and treatment at the smelting works. Several parcels have been sent to the Chillagoe, Aldershot, and Dapto smelting works, but in most cases the margin of actual profits has been too small for the experiments to be repeated.

The gold mines in the Georgetown district are being worked in a small way by lessees. Last year the Better Luck mine yielded 737 oz. of gold from 300 tons of ore, and the Wexford mine, in the same vicinity, yielded some very rich ore. The remoteness of the field, however, deters investors from acquiring mines, and the mining industry is in a languishing condition, and is likely to remain so until railroad communication is opened with the seaboard.

Various propositions have been made for constructing a railroad to the Etheridge. The first of these was started about 20 years ago; the Government commenced a railway with the object of connecting the Etheridge with the gulf coast on the Norman river, but this line got as far as Croydon, and was not extended any further. Another proposition is the extension of the present Chillagoe Co.'s line from Almaden to Georgetown, which would reach the Etheridge in about 130 miles. Negotiations are now pending between the Government and the Chillagoe Co. in regard to this line. This extension would run through some good mineral country. On leaving Almaden the line would run through country well adapted to railway building until within about 20 miles of Georgetown, where the Newcastle range would be crossed. But the difficulties could be easily overcome, the country being of a far kinder nature than that crossed by the present Chillagoe line at the head of the Walsh river, between Almaden and Mareeba. About 40 miles from Almaden the tin-mining center of Fossilbrook is situated, where 400 or 500 miners are getting tin, wolfram and bismuth. Twenty miles further on is a place called the Black Springs, where a number of men have lately opened up a new tin and wolfram camp. Quartz Hill, near which are the Lancewood tin and lead mines, is 14 miles further on, while a little further northwest are the Angore tin mines. About 20 miles after leaving Quartz Hill the Einasleigh river is crossed; copper and silver lodes exist throughout this district. The Einasleigh Copper Co.'s property is about 20 miles up the river from the intended crossing, and it has been stated that, in the event of the proposed line being built, a tramway would be constructed to connect the Company's mines with the main line. Between Einasleigh and Georgetown, gold and lead deposits have been found over a wide area, and could be profitably worked if mining facilities were improved.

WESTERN AUSTRALIA.

Opal has been discovered near the Union Jack mine, Coolgardie, West Australia. It occurs as a filling in small cavities in a schistose formation. Pieces of noble opal showing good colors have been found; but the deposit does not at present appear to offer inducements for development.

The Mines Department of West Australia has received an analysis of a specimen of mangano-tantalite found on the Wadgina tinfield. The mineral contains 79% of tantalic and niobic oxides and 1.10% of tin dioxide.

EUROPE.

RUSSIA.

The Petroleum Producers' Association, at a recent meeting, decided to re-commence work immediately on the Baku oilfields, the Governor-General having undertaken to provide troops for protection of life and property. In view of this decision, the Baku branch of the Russian Technical Society, to which most of the civil engineers employed on the oilfields belong, resolved that although the situation could not as yet be considered free from danger, nevertheless they were ready to resume their duties. In consequence of the foregoing, work was generally resumed on the oilfields. Pumping has been started, derricks, which had been destroyed are being re-erected, and machinery is being repaired and renewed with all possible speed.

MADAGASCAR.

Details of the new mining regulations, drawn up for the regulation of the mines in Madagascar, have been published. The regulations have not yet been officially promulgated as law, but the formal assent of the French Colonial Minister is now alone wanting.

The decree divides the mines of Madagascar into two categories—alluvial mines and quartz mines. In the case of alluvial mines a tax of 5% *ad valorem* on the gross output and an annual tax of 2 fr. per hectare of land will be imposed. As regards quartz mines, the system to be adopted will be similar to that in force in the Trans-

vaal. There will be a tax of 200 fr. per hectare and an *ad valorem* tax of 10 or 15%. The amount of the *ad valorem* charge has not yet been finally determined, but it is very probable that it will be fixed at 10%. The classification of mines as alluvial or quartz will be decided by the Governor upon the advice of the Colonial Council.

NEW CALEDONIA.

Exports of cobalt and nickel ores for October and the 10 months ending Oct. 31 are reported by the *Bulletin du Commerce* of Noumea as below, in metric tons:

	October.	10 months.
Nickel ore	5,601	110,560
Cobalt ore	307	7.286

Shipments of chrome ore have not yet been reported. In October a shipment of 11 tons of magnesite was made to Australia.

SOUTH AMERICA.

ARGENTINA.

According to the London *Colliery Guardian,* the coal mines owned by Messrs. Gorissen, Fellberg, Esquival & Torino in the Neuquen district have been thoroughly examined by Professor Dr. Hauthal, a German geologist, who reports that the coal is a hard coal of excellent quality. It is specially adapted for gas making, and has a calorific power of 5,078 calories, as compared with the 4,976 calories of English coal. Experiments at the Primitiva gas-works showed that, weight for weight, Neuquen coal gives more gas than Cardiff coal. The coal contains 65.2 to 71.03% of fixed carbon, as compared with 48.25% in Chilean coal. The extent of the deposits is now being proved by borings, and a company has been formed with a capital of £80,000, to work them.

Coal Trade Review.

NEW YORK, JAN. 10.

ANTHRACITE.

The hard coal market goes along without much enthusiasm owing to the unseasonable warm weather. The steam grades are in strong demand but the domestic sizes are in more than sufficient supply. Arrivals at tidewater, however, are absorbed regularly, and prices hold their usual level. The labor situation remains unchanged, and unless the drift appears to set in towards a strike, great quietness may be looked for until the opening of the new year.

Prices on domestic and small sizes remain firmly fixed at the following quotations: $4.75 for broken and $5 for domestic sizes. Steam sizes: $3 for pea; $2.25@$2.50 for buckwheat; $1.45@$1.50 for rice and $1.30@$1.35 for barley f. o. b. New York harbor shipping points.

BITUMINOUS.

The seaboard soft coal trade continues strong. It is believed that many contracts are nearly or quite filled and yet consumers are still calling for comparatively large amounts. As soon as the larger part of the contracted coal is delivered, consumers will then have to arrange for additions to their contracts for the remainder of the year, or will have to buy on the open market. Prices had weakened a little early in the month, but with the snow-storm this week they jumped by 20 or 30c. per ton. Whether they will hold this level, depends upon the weather.

Trade in the far East is active, with a strong consumption which is absorbing all shipments to this territory. Delays in unloading at the Eastern ports have already set in to some extent, holding off orders except in cases of considerable pressure; the last few weeks have seen large demurrage accruing on vessels that have secured the loading and discharging clause.

The Sound is calling for heavy deliveries particularly of the specialties. In New York harbor, trade last week was dull, coal selling down to $2.70, but with the snow went up to $2.90@$3 on the ordinary grades of steam coal.

All-rail trade is still calling for large deliveries and prices remain steady. Transportation is excellent, but cold weather would quickly interfere. Car supply is unchanged, but would be reduced by bad weather.

Vessels in the coastwise market are in good supply and rates are weaker. Current rates from Philadelphia are: to Boston, Salem and Portland, 80@85c.; to Lynn and Newburyport, $1.05@$1.10; to Portsmouth, 85@90c.; to the Sound 70@75 cents.

COAL TRAFFIC NOTES.

Coal shipments by the Southern Railway in October were 294,310 short tons. For the 10 months ending Oct. 31 the total was: Tennessee, 1,302,902; Alabama, 1,378,731; Alabama coal to Greenville for Mississippi river trade, 112,131; total, 2,793,764 tons.

Coal shipments over the Huntingdon & Broad Top Railroad for the full year were as follows:

	1904.	1905.	Changes.
Broad Top Coal	604,399	773,521	I. 169,122
Cumberland	1,106,789	1,028,919	D. 77,870
Total	1,711,188	1,802,440	I. 91,252

The Broad Top Coal is mined on the line of the road. The Cumberland is carried through over the line to the Pennsylvania Railroad at Huntingdon.

Lake shipments from Buffalo, practically all anthracite, for the navigation season of 1905, were 2,785,362 tons, of which 95,873 tons were to Canadian ports. The larger items were: To Chicago, 1,068,695 tons; Duluth and Superior, 764,566 tons; Milwaukee, 474,936 tons.

The December shipments of anthracite coal were a little larger than estimated, the total having been 5,395,113 long tons, an increase of 331,969 tons over December, 1904. For the full year the shipments by companies were as follows, in long tons:

	1904.	1905.	Changes.
Reading	11,399,622	12,574,502	I. 1,174,880
Lehigh Valley	9,611,426	10,072,120	I. 460,694
N. J. Central	7,201,276	7,983,274	I. 781,998
Lackawanna	9,333,069	9,554,046	I. 220,977
Del. & Hudson	5,276,797	5,640,528	I. 363,731
Pennsylvania	4,765,953	4,890,635	I. 124,682
Erie	5,711,173	6,225,622	I. 514,449
Ontario & West.	2,646,730	2,864,096	I. 217,366
Del. Sus. & Schuyl.	1,546,476	1,605,378	I. 58,902
Totals	57,492,522	61,410,201	I. 3,917,679

The total increase was 6.7%, the shipments in 1905 being the largest on record. Every company showed a gain.

Birmingham. Jan. 8.

The coal production in Alabama assumed shape the second day of the year and for the first time in the history of the industry the miners were anxious this year to return to work as quickly as they possibly could after the holiday period. There is demand for every ton of coal that can be mined There is a shortage of cars as well as locomotive power on the railroads.

The Acton Mining Co. was incorporated during the past week, capital stock $325,000. The incorporators are C. C. Harvey, and W. J. Kelleher, of New Orleans; Frank Y. Anderson, F. H. Eaton and J. A. W. Smith, Birmingham. Mr. Harvey is president of the company, W. J. Kelleher, vice-president, F. Y. Anderson, general manager and treasurer and F. H. Eaton secretary. The company will begin immediately opening coal mines south of Birmingham on the Queen & Crescent railroad.

The Maryland Coal Company has been incorporated by Calvin Gillis, J. C. Beatty and John London, capital stock $110,000. Coal mines will be opened at once. Calvin Gillis is president and John London secretary of the company.

Chicago. Jan. 8.

Mild weather has continued in the last week over Chicago territory, with the result that the coal trade has been very light, for the season. The coming of somewhat colder weather in the Northwest in the last of the week, has stimulated orders somewhat, but what dealers are sorely in need of is a continued spell of zero weather. Under present conditions consumption of coal everywhere is light, while the supply continues unrestricted, except by suspensions of work at the mines.

Illinois and Indiana coal is in abundant supply for the weather, prices are falling off somewhat. Lump and egg are selling for $2.10@$2.65; run-of-mine for $1.40@$1.75 and screenings for $1.15@$1.65. Hocking is fluctuating, contrary to its usual course, with the supply of some kinds abundant and of other kinds scarce, according to agents; it brings $3.25@$3.50. Smokeless is in large supply and, unless much colder weather comes, will be down to sacrifice prices: run-of-mine brings

$3.25@$3.50. Youghiogheny is plentiful and in light demand: three-quarter brings $3.10.

Authracite shares in the depression due to weather conditions, but retailers' stocks are generally light.

Cleveland. Jan. 9.

The coal market has been easier over the holidays, as there has been a better supply of hopper cars. Easier prices are expected to be wiped out by the snowstorm which is now prevailing all over this section. The best grades of steam coal are being sold at $1.30 for run-of-mine from the middle district, while Pennsylvania coal is bringing $1.05 at the mines in this territory. Pennsylvania slack is bringing 90 @ 95c at the mines; Ohio slack is selling for $1.05 at the mines.

The coke market is easier, due to the better car supply. The best grades of 72-hour foundry coke are selling at $2.50 to $2.75 at the ovens, while the best grades of furnace coke are selling at $2.60 to $2.75 at the ovens.

The demand for domestic coal is strong, with the price holding at $2.25 at the mines, Massillon, for the best grades of selected lump; other grades being shaded accordingly.

Pittsburg Jan. 9.

Coal.—The mines, both river and rail, are running satisfactorily and so far there has been no complaint as to a shortage of railroad cars. It is not likely that these favorable conditions will continue, as a cold wave with snow arrived yesterday and is expected to interfere with transportation. The rivers were navigable last week and about 2,000,000 bush. of coal was shipped to lower ports. Prices remain about the same on a basis of $1.20 @ $1.30 a ton for run-of-mine at the mine. The Pittsburg district convention of the United Mine Workers opened this morning and the general sentiment among the miners is for an advance when the present two-year agreement expires on March 31. The national convention, at which the bituminous coal mining rate will be considered and a demand formulated, will open in Indianapolis next Tuesday. The operators here anticipate trouble and declare that a suspension cannot be averted, unless there is a change of sentiment of the miners and some of the western operators. It is reported that the Illinois operators will insist that a uniform run-of-mine or screen basis be adopted for the new mining scale. The miners in the West will not accept the screen basis and neither the miners nor the operators in Ohio and Western Pennsylvania will consent to a run-of-mine basis. During the session of the convention next week a joint meeting with operators will be arranged.

Connellsville Coke.—Production shipments and prices declined last week. The falling off in production was due to the holiday, there being but five working days in the week. Standard Connellsville furnace coke for prompt shipment sold as low as $2.75 a ton but sales under contract were at $3. Foundry coke is firm at $3.50. The production for the week is given at 252,368 tons, or 52,744 tons less than the previous week. The shipments aggregated 9,909 cars, distributed as follows: To Pittsburg and river points, 3,609 cars; to points west of Pittsburg, 5,340 cars; to points east of Everson, 960 cars. The combined shipments from the Connellsville and Masontown fields amounted to 294,944 tons.

Foreign Coal Trade.

Jan. 10.

In the half-year ending Jan. 30, the production of coal in the three more important districts of France was as follows, in metric tons:

	1904.	1905.	Changes.
Pas-du-Calais	8,072,000	8,558.000	I. 486,000
Nord	3,125,000	3,277,000	I. 152,000
Loire	1,727,000	1,836,000	I. 109,000
Totols	12,924,000	13,671,000	I. 747,000

Four mines produced in 1905 a million tons each; Anzin, 1,602,000; Lens, 1,589,000; Courrierer, 1,192,000; Bruay, 1,100,000 tons. The mines of Anzin are in the Nord, the others in the Pas-du-Calais. The largest mine in the Loire is Roche-la-Moliere, which produced 415,000 tons. The production of coke and briquettes was as follows, in metric tons, for the first half of 1905:

	Coke.	Briquettes.
Pas-du-Calais	864,000	208,000
Nord	360,000	262,000
Loire	46,000	100,000
Total	1,270,000	570,000

The coke showed an increase, but the briquettes a slight decrease.

Iron Trade Review.

New York. Jan. 10

The year opens with the iron and steel trades extremely active, as they have been for some time past. New orders and inquiries continue to come in on a scale unusual for January, and specifications on existing contracts are pressed. That the year 1906 is expected to be a record breaker in the iron and steel industry is indicated by the extensive improvements planned. Thus our Pittsburg correspondent writes that the Carnegie Steel Co. has received word from headquarters of the United States Steel Corporation that the plans submitted for the proposed improvements had been approved and $7,000,000 appropriated for the work. The plans include the erection of two blast furnaces which are to be added to the Carrie group at Rankin near Pittsburg, the largest ever built. They will cost $1,000,000 each. Ten open-hearth steel furnaces will be erected at the Homestead plant to be known as open-hearth department No. 4. One modern plate mill of greater capacity than any of the seven plate mills now at the plant, will be built. The 35-in. mill will be rebuilt and will roll open-hearth and bessemer beams and other structural shapes. The large structural mill of the Jones & Laughlin Steel Co. in Pittsburg will be ready for operation about March 1.

Exports and Imports.—Exports of iron and steel, including machinery, from the United States for November and the 11 months ending Nov. 30, are valued by the Bureau of Statistics of the Department of Commerce and Labor as follows:

	1904	1905	Changes
November	$12,803,287	$ 13,346,029	I $ 1,542,742
Eleven Months.	89,682,747	118,154,305	I 28,471.558

For November there was an increase of 4.2%; for the 11 months an increase of 31%. The leading items of the iron and steel exports for the 11 months were as follows, in long tons:

	1904	1905	Changes
Pig Iron	45,884	57,179	I. 11,295
Billets, blooms, etc	296,162	203,032	D. 93,130
Bars	50,620	48,382	D. 2,238
Rails	395,849	273,306	D. 122,543
Sheets and Plates	51,246	68,507	I. 17,261
Structural Steel	47,773	72 428	I 22,655
Wire	108,412	129,874	I. 21,462
Wire-rods	18,049	5,795	D. 12,254
Nails and Spikes	39,728	44,404	I. 4,676

Exports of pipe and fittings, not reported specifically in 1904, were valued at $525,349 for November, and at $7,558,616 for 11 months. These were decreases in several items, blooms and billets, bars and rails being the most important. Rails were taken in greatest tonnage by Mexico and South American countries.

Exports of iron ore reached a total of 198,756 tons in 1905, only 4,557 tons less than the corresponding figures for 1904, which was 203,313 tons.

Imports of iron and steel, including machinery, into the United States were valued as follows for November and the 11 months ending Nov. 30:

	1904	1905	Changes
November	$ 1,542,883	$ 2,091,998	I. $ 549,115
Eleven Months	19,946,081	23,912,947	I. 3,966,866

The increase in November was 26.2%. And for the 11 months: 19.8%. The principal items for the 11 months were, in long tons:

	1904	1905	Charges
Pig Iron	73,685	185,870	I. 112.205
Billets, blooms, etc	10,277	13,188	I. 2,911
Bars	18,793	34,148	I. 15,355
Rails	37.444	16,704	D. 20.740
Wire-rods	14,062	16,054	I. 1,992
Tin plates	64,945	62,433	D. 2,512

Imports of iron ore for the 11 months were 421,264 tons in 1904 and 771,001 tons in 1905; an increase of 349.737 tons.

Imports of manganese ore and oxide were 75,681 tons for the 11 months in 1904, and 238,828 tons for the corresponding period in 1905; an increase of 163,147 tons, or over 200% more.

Birmingham. Jan. 9.

There is much strength to the pig iron market in Alabama as the new year sets in. The demand is good while a strong

inquiry is still coming in. The production in this district is improving slowly. The Tennessee Coal, Iron & Railroad Co. has blown in one furnace at Oxmoor and one at Bessemer, these furnaces being banked all through the holiday season. Alice furnace, (in the city), will be ready for the torch about Jan. 15. The Sloss-Sheffield Steel & Iron Co. will rush the improvements on one of its furnaces. This company has five furnaces in blast. The Woodward Iron Co. and the Republic Co. each have two furnaces in blast. The Alabama, Consolidated Coal & Iron Co. has three furnaces going.

There is a great amount of gossip heard in Birmingham in regard to the merger between the Tennessee Coal, Iron & Railroad Co. and the Republic Iron & Steel Co. It is currently reported that new men will be at the head of the concern. The union coal miners believe that a change in management will mean a change in policy in their behalf.

Rumors now prevail that the owners of the Alabama Consolidated Coal & Iron Co. are securing stock in the Sloss-Sheffield Co., and that there may be a merger between these two corporations.

The following quotations for iron are given; No. 1 foundry, $15; No. 2 foundry, $14.50; No. 3 foundry, $14; No. 4 foundry, $13.50; gray forge, $12.50 to $13; No. 1 soft, $15; No. 2 soft, $14.50.

The rolling mills in this district have started off the new year well. There are are no changes in the conditions at the foundries and machine shops.

Chicago. Jan. 8.

The first week of the new year has seen a fair business—fully as good as was expected by the iron trade generally. Sales have been mainly for small quantities on short-time deliveries and chiefly of Northern iron; very little contracting is being done, though inquiries are by no means scarce.

Sales of charcoal iron have been comparatively good, the price ranging between $20 and $21. Supplies of this iron now, as heretofore, are not over-plentiful. Southern No. 2 brings $14.50 @ $15 Birmingham ($18.15 @ $18.65 Chicago), and Northern No. 2 is quoted at $19 @ $19.50.

Sales of rails have been rather quiet, for the reason that the mills have reached the limit of their capacity and are not looking for further orders. Finished products generally have been in good, though not heavy, demand.

Coke is in fair, though not heavy, demand, with Connellsville at $5.65 @ $5.90 per ton.

Cleveland. Jan. 9.

Iron ore buying from the Lake Erie docks is fair at the 1906 prices, but the territory have not yet brought up to the amount for sale is not large. It is now reported that many of the furnaces in this extent of their needs for this year and will be compelled to buy in large quantities a little later on. The prices hold as they have been on the basis of $4.25 for bessemer Old Range, base quality, f. o. b. Lake Erie docks.

Pig Iron.—An exceedingly strong buying movement has appeared in foundry. Reports are that fully 25,000 tons have been covered during the week. An effort has been made to break the price but the producers refuse to make any concessions holding for $18 in the Valleys for No. 2 for all deliveries. Southern stacks are selling the principal amount of spot iron, at $14.50 Birmingham for No. 2. There is a good demand for basic and a short supply. Bessemer is in fair demand but the supply is larger, with the prospect that the Steel Corporation will take all that is left. The price on both grades is $17.50 in the Valleys for either spot delivery or on long time contracts.

Finished Material.—The market has been unusually strong. All contracts unfilled have been specified against to the full extent of the amount remaining unshipped, which, with existing contracts, insures that the mills will be kept busy until the end of the first half at least. Demand for plates from ship and car builders has caused an advance of $2 a ton in the association price to 1.70c. Pittsburg. The unusual demand for sheets has caused an advance of $2 a ton there. Stock prices as a result are marked up $1 on blue annealed and $2 on the other grades. Bar iron is scarce and strong the price being 1.70 @ 1.75c Youngstown. Billets are scarce at any price, the producer being able to command his own figures.

New York. Jan. 10.

An advance in sheets and tin-plates was announced Jan. 7. On tin plates it is 10c. per box on the base price. On sheets, it is 10c. per 100 lb., on block and galvanized sheets, and 5c. on blue annealed sheets.

Pig Iron.—There is still a good demand for foundry, chiefly from the pipe-makers and stove-makers. Basic is less called for than it has been. There is little change in prices.

For Northern iron in large lots, we quote: No. 1X, $19@19.50; No. 2X, $18.@$18.75; No. 2 plain, $17.50@$18; gray forge, $16.50@$17; Virginia foundry is held at $18.60@$19.10 for No. 1, and $18.10@$18.60 for No. 2. Basic has been $18.25@$18.75 for Alabama, and 25c. less for Northern. For Southern iron, on dock, quotations are: No. 1 foundry, $18.75; No. 2, $18.25; No. 3, $17.50; No. 4, $17; No. 1 soft, $18.75; No. 2 soft, $18.25; gray forge, $16.50. Southern prices are firm; a little extra is asked for special deliveries, especially on No. 2 soft.

Cast-Iron Pipe.—Prices are steady on a basis of $28.75 per net ton for 6-in pipe, carload lots at tidewater points. The contract for pipe for the high pressure water system in New York city has been awarded to R. D. Wood & Co., of Philadelphia. The quantity is about 35,000 tons.

Bars.—Business is good and prices are firm. Iron bars are 1.845@1.895c. for common, and 1.945c. for refined. Still higher prices are expected. Steel bars are 1.745c., tidewater. Store trade is done at about 2.50c. for iron and 2.25c. for steel.

Plates.—Steel plates are in strong demand. Tank plates are nominally 1.745@1.825c.; flange and boiler, 1.845@1.945c.; universal and sheared plates, 1.745c. up, according to width. These are the pool prices. Most new orders are placed on a premium basis, and jobbers ask heavy advances on small lots.

Structural Material.—Orders continue to come forward for bridge and building work. The mills are overwhelmed with work and deliveries on new orders cannot be promised. Prices are nominally unchanged. Beams under 15-in. are 1.845c for large lots; over 15-in., 1.895c.; angles and channels, 1.845c., tidewater delivery. These are the pool prices, and buyers have to pay all sorts of premiums, if they want deliveries soon.

Steel Rails.—No change in standard sections. Light rails are in demand, prices ranging from $26 for 35 lb., up to $33 for 12 lb. rails. Girder rails are not in request just now, but there are some inquiries coming in.

Old Material.—Demand is better, and prices are firm. No. 1 railroad wrought is $22@$23; No. 1 yard wrought, $21@$22; machinery cast, $14@$15; heavy steel melting scrap, $18@$18.50. These prices are on cars, Jersey City or other terminal delivery.

Philadelphia. Jan. 10,

Pig Iron—Considerable excitement prevails in the eastern iron market, especially for steel-making and pipe-making purposes. There have also been large transactions in basic iron. In other kinds the market is quiet. Very little is being done in forge. The smaller consumers of forge are buying very little and are showing no diposition to make any further provision for the future. For steel making purposes a large volume of January and February business is in sight. Quotations are substantially the same as for last week and may be given at $19.50 for No. 1 X; $18.50 for No. 2 X; $18.25 for No. 2 plain and $17 for forge.

Steel Billets— There is a good deal of inquiry at present for steel billets and as producers are oversold the business has been unimportant; but efforts are being made by buyers to place contracts for large lots. The usual quotations prevail.

Muck Bars.—Inquiries have come from western sources for muck bars and sales are reported at former figures.

Bar Iron.—The market remains very firm; small lots are going at a premium where immediate delivery is demanded. Stores are selling remarkably well for the season both in this city and the country districts. Steel bars in small lots have been exceptionally active, but larger transactions are just now absent.

Sheet—Sheets have advanced $2 per ton and the advance will make no difference with buyers, most of whom are anxious to place orders for 30 day's delivery.

Pipes and Tubes.— Pipes are strong, no change in discount, mills are unable to book business for early delivery and negotiations have just been renewed for late deliveries.. Tubes are very active.

Merchant Steel.—A great deal of merchant steel is being delivered on old orders, but the business sent to the mills recently is small.

Plates.— The condition of the plate market is about as heretofore and specifications are once more crowding into the mills which are badly oversold.

Structural Material.—A large amount of business has been done in structural material and the pressure of inquiry is still felt. A great deal of bridge material will have to be contracted for this month.

Steel Rails.—Steel rails are quiet so far as new inquiries are concerned. The inquiries for trolley lines are once more active and representatives of rail mills state they will be able to book some of the heaviest orders if they can only make satisfactory arrangements as to deliveries. There is also additional inquiry this week for light rails some coming from miners who have arranged to build a good deal of mine road.

Scrap.—Everything in the way of old steel rails has been snapped by one or two large consumers and there is now inquiry for more stock. There is also active inquiry for old iron rails but no transactions have been reported for several days. The scrap iron market is quiet not because of lack of inquiry or demand, but because all desirable stocks have been cleaned up.

Pittsburg. Jan. 9.

The principal news features of the week in the iron and steel trade include the buying of outside bessemer pig iron by the United States Steel Corporation; an advance of $2 a ton in prices of sheets, 10c a box on tin plate and $1 a ton on wire and wire products. The new prices became effective yesterday. Higher prices for sheets and tin-plate were expected at the opening of the year and the announcement of the increase by the American Sheet & Tin Plate Co. yesterday did not cause any surprise. The rate for black sheets is now based on 2.40c for No 28 guage and 3.45c for galvanized sheets of the same guage, f. o. b. Pittsburg. The tin-plate prices are established on a basis of $3.50 a box for 100-lb. cokes. Customers who buy their entire supply from the leading interest are allowed a rebate of 5c. a hundred pounds on sheets and 5c. a box on tin-plate. The independents are expected to quote these prices in the future, but so far have made no announcement of a change. There has been a remarkable increase in the demand for both sheets and tin-plates and but for the continued scarcity of sheet and tin-plate bars all the idle mills of the big producer would be in operation. The week opened with 92½% of its 164 sheet mills and 75% of its 242 tin-plate mills running. It was thought all could be operated this week as the Ohio works of the Carnegie Steel Co. began making sheet and tin-plate bars early last week, but so far deliveries have not warranted starting the idle mills. The bessemer steel plant of the Republic Iron & Steel Co. also has been put on bars and the scarcity is expected to be relieved in a short time.

The wire market has been getting stronger steadily since production was curtailed last summer and an advance was expected last fall. The increase ordered yesterday by the American Steel & Wire Co. makes the new prices $1 a ton higher all around as follows: plain wire, $1.70 per 100 lb.; painted barb wire, $2; galvanized, $2.30; wire nails, $1.85 per kg.; all f. o. b. Pittsburg. The independents it is understood, will quote the new prices.

All danger of a runaway pig-iron market seems to have been averted by the action of the United States Steel Corporation in not placing a contract for a large block of iron for first quarter shipment. Instead, it is said, the corporation decided to buy small lots at ruling prices, and as quietly as possible. It is known to have bought two lots of bessemer iron, one of 4,000 tons and one of 3,000 tons, for delivery this month, paying $17.50 Valley furnace. The furnaces are pretty well sold up for the first quarter, that the corporation to-day closed a deal with the Bessemer Pig Iron Association and W. P. Snyder & Co. for 90,000 tons of iron for delivery during the second quarter at the rate of 30,000 tons a month. The price was not made public, but it is said to be $17.40 @ $17.50, Valley furnaces. The market is very strong, and it is believed the price of bessemer could easily have been put at $19 or even $20 if the Corporation had entered into a contract for all the outside iron it could use in the first quarter. Sales of pig iron to independent steel interests during the past week were unusually large for the first week in a new year, and aggregate about 15,000 tons. The minimum price was $17.50, Valley, but a number of small lots were sold at $17.75.

Pig Iron.—Outside of the iron bought by the United States Steel Corporation, sales during the week to independent interests aggregated fully 15,000 tons of bessemer iron. The market is strong at $17.50 @ $17.75, Valley furnaces. There is a good demand for foundry and forge iron. Foundry No. 2 is quoted at $17.50 @ $18, Valley, and gray forge at $17.35, Pittsburg.

Steel.—There is still a scarcity of steel, but the demand is confined chiefly to small lots. Bessemer and open-hearth billets are held at $26 and sheet-bars at $27. Merchant steel bars are quoted at 1.50c, and plates at 1.60c.

Sheets.—The demand is improving and prices are $2 a ton higher. The leading producer sells black sheets at 2.40c. and galvanized at 3.45c. for No. 28 guage.

Ferro-Manganese.—There seems to be a slight improvement in the supply and a lot of 80% ferro was offered last week at $135. The highest point reached was late in December, when $175 a ton was paid for one carload lot.

Cartagena, Spain.

Iron and Manganiferous Ores.—Messrs. Barrington & Holt report that shipments for the week were one cargo, 500 tons manganiferous ore, to Marseilles; two cargoes, 4,900 tons dry ore, to Great Britain. Dealings have been light and freights are easier. It is generally surmised that as soon as pumping operations start seriously in this sierra, as they are expected to do early in the year, a considerable metaliferous zone will be drained, and thus a larger production of manganiferous ore should be obtainable.

Quotations for iron ores show little change. Ordinary 50% ore is 7s. 8d.@8s.; special low phosphorus, 8s. 2d.@8s. 6d.; specular ore, 58% iron, 11s.; S. P. Campanil, 9s. 6d. per ton. All prices are f. o. b. shipping port. Manganiferous ores, same terms, range from 10s. 8d. for 35% iron and 12% manganese, up to 17s. 3d. for

Pyrite.—Iron pyrites, 40% iron and 43% sulphur are quoted at 10s. per ton f. o. b. Cartagena.

Heavy Chemicals and Minerals.

NEW YORK, JAN. 10.

The general market for heavy chemicals in the new year has scarcely moved from what it was in the closing days of the last calendar year. There are slight declines on some articles, but these are just about balanced by slight advances on others On the whole, in so far as the market is indefinite, it is expectant, waiting for the holiday interruption to disappear, and looking to the future with the optimism which seems to support the trade in general.

Sulphur.—This shows a slight decline of 12½c. per ton. This has no superficial significance as the market is steady. We give herewith the prices for the American product. Sicilian is quoted the same for Atlantic ports as the Louisiana products.

One of the prominent Sicilian exporting houses has sent out word that low-grade Sicilian sulphurs are being exported to America under a classification differ-

ent from that to which they are entitled. It will therefore be well for consumers of Sicilian brimstone to watch the foreign sulphur arriving in this country and have it analyzed for its sulphur contents.

Pyrite.—This continues unchanged and in steady demand, the production being constantly absorbed, with a possibility of an upward tendency in prices.

Nitrate of Soda.—This, after a slight decline in price, opens the new year with a market which is quiet in New York, but very strong on "the coast." Contracts for the first half of the year are reported at $2.20, and for the whole year year at $2.18 @$2.20. Quotations are for 96%; 95% are quoted 2½ to 5c. per 100 lb. lower. Brokers report imports from West Coast, S. A. for 1905 as 270,300 tons; compared with 239,964 in 1904. Prices current Dec. 1, 1905, were 2.20c. as compared with 2.37½c. a year ago. The visible stock is only about 8,000 tons.

Salt Cake.—This is quoted at 65c. per lb. on contract for carload lots. The *heavy alkalies* (carbonates and caustic) show a sustained demand.

Sulphate of Copper.—This reports another slight advance probably in sympathy with the sustained strength of the metal. The price is given herewith.

Tin Crystals.—These are quoted at 21½c.@23c. *Tin bichloride* is reported at 10½c@11c. The slight advances quoted for these are evidently sustained both by the demand of consumers of the salts, and by the advanced price of the metal.

Phosphates.—Phosphate companies report the same situation as noted hitherto and recently. Prices are the same and the market is firm.

PRICES.

Acids.		
Boric, crystals	per lb.	.10
powdered	"	.10½
Carbonic, liquid gas	"	.12½
Hydrofluoric, 30%	"	.03
48%	"	.05
60%	"	.11
Nitric acid, 36°, 100 lb	"	$4.75
38°, 100 lb	"	5.25
40°, 100 lb	"	5.50
42°, 100 lb	"	5.75
Oxalic acid, com'l, 100 lb		$5.00@5.25
Sulphuric acid, 50°, bulk, ton		13.50@14.50
60°, 100 lb. in carboys		1.05
60°, bulk, ton		18.00@20.00
66°, 100 lb. in carboys		1.20
66°, bulk, ton		21.00@23.00
Blue Stone (Copper Sulphate), carload lots, per 100 lb		$5.90 @$6.00
Nitrate of Soda, 100 lb.....96%		2.20
Sulphate of Ammonia, per 100 lb		3.10@ 3.15

Phosphates.	F. o. b.	C. I. F. Gt. Britain. or Europe
Sulphur.		
Louisiana, New York, Boston or Portland	ton	$22.12½
Philadelphia or Baltimore	"	22.62½
Pyrite.		
Domestic, furnace size	Unit	11c.
Fines	"	10c.
Imported, lump, At. ports	"	10@11c.
" fines " "	"	9½@10c.
" furnace size	"	11½@12c.

Pyrite prices are per unit of sulphur. On lump deliveries, a charge of 25c. per ton is made for breaking to furnace size.

*Fla., hard rock	$7.75@8.00	$10.90@12.10
land pebble	4.00@4.25	7.95@ 8.65
†Tenn., 78@80%	4.60@4.65	.....
78%	4.00@4.25	.....
75%	3.65@3.75	.....
68@72%	3.25@3.50	.....
‡So. Car. land rock	4.00@4.25	.....
river rock	3.75@4.00	.....

*F. o. b. Florida or Georgia ports. †F. o. b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

Metal Market.

New York, Jan. 10.

Gold and Silver Exports and Imports.

At all United States Ports in Nov. and Year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Nov. 1905	$1,137,318	$5,171,141	Imp. $4,033,823
" 1904	20,813,443	4,727,105	Exp. 16,086,338
Year 1905	44,125,935	46,514,475	Imp. 2,388,540
" 1904	107,709,000	81,467,050	Exp. 26,241,950
Silver:			
Nov. 1905	5,631,819	4,272,581	Exp. 1,089,238
" 1904	3,405,366	2,439,742	" 965,824
Year 1905	49,316,953	30,930,532	" 18,386,421
" 1904	46,020,584	23,834,087	" 22,186,497

These statements cover the total movement of gold and silver to and from the United States. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Exports and Imports, N.Y.

For the week ending January 6, and for years from January 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$518,000	$26,276	$3,973,138	$42,947
1906	518,000	26,276	3,973,138	42,947
1905	2,356,370	32,100	755,921	29,699
1904	84,591	625,709	814,450	25,208

Exports of gold for the week were to South America; of silver to London. Imports, both gold and silver, were from the West Indias.

With present facilities of communication, there is no longer a special market for gold anywhere. Thus, when London wants to ship gold to Argentine, the metal is just as likely to be taken in New York, if exchange rates favor.

In December some heavy shipments of gold were made to Argentine from New York, the total gold exported from the United States to South America in 1905 was $11,642,190, of which over $11,000,000 went to Argentine. These shipments are made on London account, and are sent from New York because, on certain rates of exchange, there is a saving in getting the gold here, instead of London. In ten past years the amount of gold sent to Argentine from New York has varied largely. In 1904 the amount was $2,750,000; in 1903 it was $8,850,000; in 1901 and 1902, none was sent; in 1900, it was $2,400,000; in 1899, 1898 and 1897, none; in 1896, a total of $3,500,000 was sent.

The statement of the New York banks —including all the banks represented in the clearing house for the week ending Jan. 6, gives the following totals, comparison being made with the corresponding week of 1904.

	1904.	1905.
Loans and discounts	$1,069,742,700	$1,004,658,300
Deposits	1,119,168,600	983,742,800
Circulation	43,172,400	52,912,900
Specie	203,684,000	167,336,000
Legal tenders	85,216,400	79,170,700
Total Reserve	$288,900,400	$246,506,700
Legal requirements	277,292 150	245,935,700
Surplus	$11,608,250	$571,000

Changes for the week this year were increases of $3,633,300 in loans, $3,470,900 in legal tenders and $6,091,500 in deposits; decreases of $5,669,000 in specie, $183,100 in circulation and $3,721,500 in surplus reserve.

The following table shows the specie holdings of the leading banks of the world. The amounts are reduced to dollars.

	Gold.	Silver.
New York Associated	$167,336,000	.....
England	143,742,965	.....
France	570,261,510	$213,094,820
Germany	150,660,000	50,220,000
Spain	75,135,000	114,185,000
Netherland	33,024,500	30,758,500
Belgium	15,893,335	7,996,665
Italy	137,020,000	17,013,500
Russia	518,050,000	18,145,000
Austria	223,775,000	60,615,000

The returns of the Associated Banks of New York are of date Jan. 6, and the others Jan 5. The foreign bank statements are from the *Commercial and Financial Chronicle*, of New York.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell's as follows, for the year to Dec. 28.

	1904.	1905.	Changes
India	£9,527,618	£7,530,421	D. £2,297,177
China	512,792	886,847	I. $74,055
Straits	79,268	38,299	D. 40,969
Total	£10,119,678	£8,155,567	D. £1,964,111

Receipts for the week were £6,000 from Australia, £5,000 from the West Indies and £138,000 from New York; a total of £149,000. Exports were £546,000 to India and £3,257 to China; £549,327 in all.

Silver, after a recession to 29 11/16d., has developed considerable strength and, under the impulse of Indian demand, has advanced to 30¼d. for spot metal in London. Considerable shipments of Mexican dollars have been made from Mexico during the recent advances.

The movement of gold in France for the 10 months ending Oct. 31 was as follows:

	1904.	1905.
Imports	Fr. 555,956,000	Fr. 716,376,000
Exports	111,891,000	110,698,000
Excess imports	Fr. 444,065,000	Fr. 605,678,000

There was an increase of 161,613,000 fr. in the net imports of gold. The movement of silver was as follows:

	1904.	1905.
Exports	Fr. 91,996,000	Fr. 81,385,000
Imports	81,621,000	80,746,000
Excess exports	Fr. 10,375,000	Fr. 639,000

Exports of copper and nickel coins were 385,000 fr. in 1904, and 286,000 fr. in 1095. Imports were 130,000 fr. in 1904, and 130,000 fr. last year.

SILVER AND STERLING EXCHANGE.

Jan.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	Jan.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
4	4.85¼	64¼	29⅜	8	4.85½	65	30 1/16
5	4.85⅜	64⅜	29 13/16	9	4.86⅛	65	30
6	4.85⅜	64⅛	29 11/16	10	4.86¼	65⅛	30¼

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, .925 fine.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars	$0.50¼	$0.52
Peruvian soles and Chilean pesos	0.46¼	0.47
Victoria sovereigns	4.85½	4.87½
Twenty francs	3.86	3.88
Spanish 25 pesetas	4.78	4.8

Other Metals.

Daily Prices of Metals in New York.

January	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
4	18⅛ @19	18⅛ @18⅞	79¾	36	5.60	6.60 @6.65	6.45 @6.50
5	18½ @19	18⅜ @18⅞	79¼	36	5.60	6.60 @6.65	6.45 @6.50
6	18⅛ @18⅞	18⅜ @18¾	....	36	5.60	6.65 @6.70	6.50 @6.55
8	18⅛ @18⅞	18⅜ @18¾	79½	36¼	5.60	6.65 @6.70	6.50 @6.55
9	18⅛ @18⅞	18⅜ @18¾	79 15/16	36⅜	5.60	6.65 @6.70	6.50 @6.55
10	18⅛ @18⅞	18⅜ @18¾	79 15/16	36½	5.60	6.65 @6.70	6.50 @6.55

London quotations are per long ton (2,240 lb.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars. The price of cathodes is usually 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting & Refining Co. for near-by shipments of desilverized lead in 50-ton lots, or larger orders. The quotations in spelter are for ordinary western brands; special brands command a premium.

Copper.—The market has been rather dull, with a slightly easier tendency, although near-by shipments still command a premium. Consumers on the whole appear to be well supplied for the present. Operations both at the smelters and refining works have been greatly facilitated by the open winter. The market closes at 18½@18⅞ for Lake copper; 18⅜@18¾ for electrolytic in ingots, cakes and wirebars; 18⅛@18⅝ for casting copper; the range being chiefly according to delivery.

The London standard market is weaker, and there is pressure to sell the three months' option. The close is easy at £79 13s. 9d. for spot, £79 1s. 3d. for three months.

Refined and manufactured sorts we quote: English tough, £85@86; best selected, £86@£87; strong sheets, £95.

Exports of copper from New York for the week were 1,988 long tons. Our special correspondent reports the exports from Baltimore for the week at 2,333 long tons of fine copper.

Tin.—The market for this metal is still in excellent shape. Consumption surpasses all expectations both here and in Europe, while supplies are not increasing adequately. It is not surprising, therefore, that prices are holding very well, and after the decline noted last week there has been a sharp reaction, bringing the London market at the close up to £165 10s. for spot, £165 17s. 6d. for three months, while our market is firm at 36½ cents.

Lead.—Prices are unchanged; however, the tendency is not quite so firm, owing to the fact that the London market has developed considerable weakness. The closing there is lower at £17 for Spanish lead, £17 1s. 3d. for English lead. Spot lead at New York and St. Louis still commands a premium, sales having been made at the former around 5.90, and at the latter around 5.85 cents.

St. Louis Lead Market.—The John Wahl Commission Co. reports on Jan. 6 as follows: Receipts amounted to 24,160 pigs this week, against 31,215 pigs last week: Shipments 32,240 pigs this week, against 23,810 pigs last week. Scarce, in mand, higher, buoyant and very firm. In fact, little could be done, owing to the strong views of holders; $5.85 was generally bid early and $5.90 later, but aside from the sale of 100 tons at $5.90 there was none reported sold, nor any offered below $6 per hundred.

The company telegraphs us on Jan. 10: Lead strong, but quiet; Missouri brands are 5.85@5.87½c., nominally.

Spanish Lead Market.—Messrs. Barrington & Holt write from Cartagena, Spain, under date of Dec. 23, that silver has been 15.25 reals per ounce. Exchange is 31.92 pesetes to £1. Pig lead has been 90.75 reals per quintal; equal, on current exchange, to £15 18s. per long ton, f. o. b. Cartagena. Shipments for the week were 310 tons argentiferous to Marseilles, and 100 tons desilverized lead to Genoa.

Spelter.—There has been a somewhat better inquiry for this metal, and also speculative buying has helped the situation. These developments combined have brought about an advance, and the market closes firm at 6.65@6.70c. New York, 6.50@6.55c. St. Louis.

The London market is somewhat easier, and closes at £29 5s. for good ordinaries, £29 10s. for specials.

St. Louis Spelter Market.—The John Wahl Commission Co. on Jan. 6 reports as follows: Receipts compare 66,580 slabs this week, with 84,270 slabs last week. Shipments 71,730 slabs this week, against 90,570 slabs last week. Sales reported include 300 tons at $6.45 on Tuesday, and 100 tons at $6.50 on Thursday. Otherwise, there was some disposition shown to sell at $6.50, but no bids at over $6.45. Market not so firm as it has been heretofore.

The company telegraphs us on Jan. 10: Spelter is firm and advancing, the latest sales being on a basis of about 6.55c. Offerings are very light.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Dec. 23, that prices are nominally unchanged at 95 fr. for blende, 35% zinc, and 72 fr. for calamine, 30% zinc. There has been no change in conditions, though some small operators seem inclined to press sales needing money for the close of the year.

Zinc Sheets.—The price of zinc sheet has been increased to $8 per 100 lb. (less discount of 8%), f. o. b. cars Lasalle and Peru, in 600-lb. casks, for gauges No. 9 and 22, both inclusive, widths from 32 to 60 in., both inclusive, and lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 lb. The fluctuations in the base price for sheet zinc since January 1, 1905, have been as follows: December 30, 1904, $7.25; January 7, 1905, $7.50; May 12, $7.25; June 1, $7; July 29, $7.25; August 10, $7.50; December 1, $7.75; January 6, 1906, $8. The demand is reported active.

Antimony.— This metal is very firm, and quotations are 14@15c. depending upon brands and deliveries.

Nickel.—Quotations for large lots, New York, or other parallel delivery, are 40@47c. per lb., according to size and condition of order. For small quantities, prices range from 48 up to 60c., also according to size of order and deliveries.

Platinum.—Quotations are firm at $20.50 per oz. Gas-engine sparking points vary from 87c. for "A", to $1.80 for "B."

Platinum in manufactured forms is strong. Messrs. Eimer & Amend, of New York, quote for different forms as follows: Heavy sheet and rod, 75c. per gram; foil and wire, 80c.; crucibles and dishes, 85c.; perforated wire, 90c.; and cones, $1 per gram.

Quicksilver.—Prices in New York continue steady at $40 per flask for large orders—over 100 flasks—and $40.50 for jobbers' lots, down to 10 flasks. For retail quantities, under 10 flasks, pound prices are charged, which work out to $41.75@$42.25 per flask. San Francisco prices are steady at $39 for domestic orders, and $37.50 for export. The London price is £7 5s., but second hands ask only £7 2s. 6d. per flask.

Maganese Alloys.—Prices for these alloys in Germany are given by Paul Speier as below. The prices are for orders of not less than 50 kg. delivered in Bremen, and are as follows, per 100 kilograms:

	Marks.
Manganese copper, No. 1, 30% Mn	275
No. 2, 28% Mn	180
No. 3, 20 to 25%, with 2 to 4% iron	165
Manganese tin, No. 1, 55% Mn., no iron	480
No. 2, 56% Mn., some iron	280
Manganese nickel, No. 1, free from iron	450
No. 2, traces of iron	270

Maganese metal is quoted as 3.60 marks per kg.—38.8c. per lb.—delivered in Bremen. These alloys are made by the Isabellenhütte, in Bonn, Germany, which is represented by Mr. Speier in Breslau as selling agent.

Minor Metals.—For minor metals and their alloys, wholesale prices are f. o. b. works:

Aluminum	Per lb.
No. 1, 90% ingots	33@37c.
No. 2, 99% ingots	31@34c.
Rolled sheets	4c. up.
Aluminum-bronze	20@23c.

Nickel-alum	38@39c.
Bismuth	$2.50
Cadmium, f. o. b. Hamburg	77c.
Chromium, pure (N. Y.)	80c.
Copper, red oxide	50c.
Ferro-Molybdenum (50%)	95c.
Ferro-Titantium (20@25% N. Y.)	75c.
Ferro-Chrom, (75%)	12½c.
Fegro-Tungsten (37%)	29c.
Manesium, pure (N. Y.)	$1.60
Manganese (98@98% N. Y.)	75c.
Manganese Cu. (30@70% N. Y.)	40c.
Molybdenum (98@99% N. Y.)	$1.75
Tantalic acid (N. Y.) (oz)	40c.
Phosphorus, Foreign	45c.
Phosphorus, American	70c.
Tungsten (best), pound lots	90c.

Variations in price depend chiefly on quantities and deliveries.

Missouri Ore Market.

JOPLIN, JAN. 6.

The highest price paid for zinc ore was $53 per ton, a decline of $1, with the assay basis quoted all the way from $45 to $49 per ton of 60% zinc. The average price for all grades for the week was $44.88 per ton.

Lead ore advanced $2 per ton, all 80% grades being settled for at $80 per ton. There were "drybone" sales this week and prices averaged on 80% grades.

Zinc ore is $2 per ton less and lead $20 per ton higher than a year ago. The zinc shipment of the week was light, being 703 tons less than the same week of 1905, and 919 tons less than the average shipment of last year. The lead shipment was 63 tons larger than a year ago, and a little larger than the average of last year's weekly shipments.

Following are the shipments of zinc and lead for the week ending today:

	Zinc, lb.	Lead, lb.	Value.
Joplin	2,496,180	242,460	$69,605
Carterville-Webb City	1,456,720	650,100	58,855
Galena-Empire	671,530	126,690	20,570
Duenweg	511,120	75,970	14,535
Granby	504,000	85,000	11,625
Aurora	427,130	.....	7,370
Neck City	233,380	.....	5,830
Alba	223,130	.....	5,570
Badger	203,100	.....	4,770
Oronogo	151,940	18,000	4,335
Carthage	166,960	.....	4,170
Baxter Springs	183,640	.....	4,130
Central City	179,990	.....	4,050
Prosperity	65,670	29,700	2,660
Reeds	92,610	.....	2,240
Zincite	74,500	.....	1,790
Spurgeon	109,970	.....	1,650
Wenthworth	48,980	.....	1,150
Stott City	36,920	.....	885
Beef Branch	33,660	.....	435
Totals	7,971,130	1,230,029	$226,225
Same week last year,	9,277,510	1,103,710	$250,680

Zinc value the week, $176,695; lead, $49,530

So far the winter has been mild and open, with the temperature only to freezing on a few occasions. What snow has fallen resulted in making roads not macadamized rather soft for hauling, but the most of the moisture has fallen as rain. Some 4,000 to 5,000 tons of ore is being held by producers who are expecting an advance in case of severe weather—hoping for a repetition of last year. Conditions are, however, vastly different this year. There is five times as much stock in the bins and the smelters are comfortably supplied with stocks at the works.

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1904.	1905.	Month.	1904.	1905.
January	33.33	52.00	January	55.55	61.50
February	33.63	52.77	February	56.37	67.62
March	35.40	47.40	March	57.20	67.20
April	35.75	42.88	April	58.00	58.00
May	34.87	43.31	May	57.77	58.27
June	34.93	40.75	June	56.60	57.80
July	33.37	43.00	July	53.00	58.00
August	37.55	48.83	August	53.00	58.00
September	40.18	46.75	September	53.50	63.50
October	43.65	47.60	October	53.50	63.86
November	43.95	49.55	November	54.70	68.67
December	46.38	49.00	December	55.55	76.25

Wisconsin Ore Market.

PLATTEVILLE, Jan. 6.

There was llttle or no competition in the zinc ore market for high-grade ore, except in one or two instances for the choice lots which brought as high as $54 per ton. The ruling assay basis price for 60% ore was $52, at which price the Dall ore was sold. The lower grades carrying as high as 15 and 16% iron brought a little higher price than last week. One lot, where the owners have a magnetic separating plant, was reported as being sold, as such a price was offered that it did not pay to roast it. Lead is scarce, and none reported as being loaded.

The following camps in the Platteville district report tonnage loaded as follows:

	Zinc, lb.	Lead, lb.	Sulphur, lb.
Platteville	338,720	.....	.....
Cuba City	66,000	.....	.....
Buncombe-Hazel Gr.	308,100	.....	.....
Montfort	.....	.....	602,560
Total	712,820	.....	602,560

The other camps have not reported anv ore loaded. Severe rains and bad roads were the causes.

Mining Stocks.

New York. Jan. 10.

The stock market continues variable and uncertain, with some cross-currents that are difficult to explain. The market is controlled and worked still by certain pools and cliques of larger operators, but with the opening of the year there are signs that the public is taking more interest than it has, and outside buying orders come in more freely.

On the New York Exchange, Amalgamated and Anaconda have kept at high levels, and have been the chief mining stocks of interest. The industrials have been strong and active, United States Steel, Tennessee Coal and Iron and Virginia-Carolina Chemical being leaders. In the outside market the copper stocks have generally advanced, with occasional checks, due chiefly to profit-taking.

Business in Comstock and Tonopah shares on the Consolidated Exchange has been about as usual. Very little was done in the Colorado stocks.

Boston. Jan. 9.

Mining shares have continued on their upward course since the advent of the new year and the market has been broad and active, in the main. Prices in some instances have been record ones, notably Old Dominion, United States and Utah Consolidated. From the start the share market has been a healthy one, as it is based on a strong foundation in the metal market, which means prosperity for the companies and increased dividends for shareholders. Osceola and Tamarack dividends were recently increased, the former declaring $4, semi-annually and the latter $3, although price changes have been unimportant in either case. United States mining closed tonight at its record price, $49.50. The directors had an all day session today, having under consideration certain financial plans. It is proposed to organize a new company with both preferred and common stock in which the present United States stock will be given the privilege of subscribing for new common stock at par, $50. The company will do a general mining and smelting business, and will enter into active competition with the smelting trust.

Old Dominion has been well taken up to $42. The company will undoubtedly pay fair-sized dividends this year. Parrot made its new record for a long time by touching $48 although the close tonight was $6 below this. The strike in the Anaconda mine as well as the Parrot have added interest to the Amalgamated group of stock. Amalgamated has sold above $111, although it reacted to $104, and closed tonight at $109. Anaconda touched $74.25 in this market Dec. 30. Utah Consolidated touched $63.12½ and holds strong. Bingham was given a whirl last week touching $37.12½, althought it is off to $36 tonight. Certain negotiations are said to be under way relative to this property. Renewed favorable conditions on the Kearsarge lode resulted in an active speculation in Allouez, which rose to $47, Franklin, which touched $19.50 and Rhode Island, which went to $8. Reactions resulted in all of them, however.

Speculation in North Butte, United Copper and Boston Consolidated has tamed down. The first-named closed at $85.50 tonight, United Copper at $64.50 and Boston at $32.25. American Zinc rose to $16.75. The holdings of this stock are such that it will be an easy matter to advance it. Copper Range has been well held, closing tonight at $82.25. The disappointment in Shannon is shown in the price, $6.75. The curb continues to be active with several new stocks seeking honors. The standard stocks there have been held well.

San Francisco. Jan. 4.

The Comstocks have been quiet and a little weak. Ophir closed at $6; Mexican $1.40; Consolidated California and Virginia, $1.30. Trading opens the year rather light.

The Tonopah market was active, with heavy sales. Tonopah, of Nevada, brought $16.25; Montana Tonopah, $2.55; Tonopah Belmont, $2.25; Tonopah Midway, $1.75; Jim Butler, 75c per share.

Oil stocks continue dull, with few sales recorded.

Colorado Springs Jan. 5.

The last few days of this week marked quite an increase in activity in Cripple Creek stocks, and the volume of trading on the local exchange was correspondingly larger. A report of a strike in one of the properties of the Findley Co. caused that stock to advance from 75c. of one week ago to 84⅛ on today's market. Dante is selling for 6¼c.; Elkton remains at 48c.; El Paso has made a fractional gain, selling today for 67c.; Isabella is selling for 23⅝c.; Portland at $2.05; Independence at 15c., and U. G. M. at 12¾c. The Stratton Leasing & Development Co. has declared its first dividend, amounting to $50,000 in all.

Dividends.

Company.	Payable.	Rate.	Amt.
Am. Smelting & Ref.	Jan. 15	$1.75	$875,000
Am. Smelting & Ref., pfd.	Jan. 2	1.75	875,000
Bunker Hill & Sullivan	Jan. 4	0.60	180,000
Granby Con.	Jan. 15	0.30	399,991
International Nickel, pfd.	Feb. 1	1.50	133,689
Stratton Leasing & Dev. Co.	Jan. 10	....	50,000
Tenn. Coal, Iron & R. R.	Feb. 1	1.00	225,531
Tenn. Coal, Iron & R.R., pfd.	Feb. 1	2.00	4,966
Tonopah of Nev.	Jan. 22	0.25	250,000
Utah Con., Utah	Jan. 15	2.50	750,000
Virginia-Car. Chem., pfd.	Jan. 15	2.00	360,000
Vulcan Detenning, pfd.	Jan. 20	2.25	33,750

*Monthly. §Bi-monthly. †Quarterly. ‡Semi-Annually.

Assessments.

Company.	Delinq.	Sale.	Amt.
Alta Sierra		Jan. 31	$0.20
Brunswick-Chollar	Dec. 30	Jan. 22	0.03
Bruswick Con. Va.	Dec. 28	Jan. 18	0.05
Brunswick-G. & Curry	Jan. 12	Jan. 31	0.03
Bullion	Jan. 11	Feb. 1	0.05
Chollar	Dec. 18	Jan. 8	0.10
Last Chance, Cal.		Jan. 27	0.005
Gould & Curry	Dec. 22	Jan. 10	0.10
Julia Con.	Jan. 6	Jan. 29	0.03
Little Chief, Utah			0.01
Orient Gold Placer	Dec. 30		0.05
Overman	Jan. 3	Jan. 22	0.10
Segregated Belcher	Dec. 8	Dec. 28	0.05
Silver Shield, Utah	Jan. 13	Jan. 29	0.03

St. Louis. Jan. 6.

	High.	Low.
Adams	$ .40	$ .25
American Nettie	.17	.12
Center Creek	2.75	2.40
Central Coal & Coke	64.00	62.50
" " " pfd.	82.00	81.00
Central Oil	60.00	55.00
Columbia	1.00	.25
Con. Coal	33.00	32.01
Doe Run	200.00	160.00
Granite Bimetallic	.17	.15
St. Joe	24.00	19.00

LONDON. (*By Cable.**) Jan. 6.

	£	s.	d.
Camp Bird	1	12	6
Consolidated Gold Fields	5	17	6
De Beers	17	15	0
Dolores	2	2	6
East Rand	6	13	9
El Oro	1	8	9
Esperanza	5	3	9
Modderfontein	7	13	9
Rand Mines	7	7	6
Rio Tinto	67	2	6
Simmer and Jack	1	11	3
Stratton's Independence	0	8	3
Tomboy	1	7	6

*Furnished by Wm. P. Bonbright & Co., New York.

STOCK QUOTATIONS.

NEW YORK. Week Jan. 10

Name of Company.	High	Low	Clg.	Sales
*Amalgamated	110⅜	105¼	108⅞	872,050
Anaconda	287	230	256	425,400
British Col. Copper	10⅛	9⅝	9⅞	10,485
Federal	146	138	143	2,510
Federal, Pf.	106	104	105	2,470
Greene Copper	30⅞	29¾	29¾	27,895
Greene Gold	4	3¾	3¾	3,333
Mitchell	10⅛	9⅝	10⅛	5,375
Tennessee Copper	52⅞	50	50⅜	22,300
Union Copper	1⅛	1⅛	1⅛	6,410
United Copper,	65¼	60	64¾	150,200
United Copper, Pref.	91	88	88⅓	1,780
Utah Apex	9	8⅜	8¾	7,400
Utah Copper	39	38	38¼	18,740

NEW YORK INDUSTRIALS.

Am. Smelting & Ref.	168	162½	164	11,900
Am. Smelting & Ref., Pf.	129	127	127⅛	7,700
National Lead	89⅛	80½	86⅜	32,600
Pittsburg Coal	15⅞	14⅞	15	500
Pittsburg Coal, pf.	62	60	60	600
Republic I. & S.	38¼	32½	37	67,050
Republic I. & S., Pf	110½	105	108⅝	23,320
Tenn. C. & I.	149½	129	147⅜	38,600
U. S. Red. & Ref.	33	32	32¼	1,600
U. S. Red. & Ref., Pf.	71	69½	70	800
U. S. Steel	45	42	44¼	696,650
U. S. Steel, Pf	107⅞	105	107	126,728
Standard Oil	699	693	699	281
Bethlehem Steel	33	32	32¾	1,780

BOSTON.

Allouez	47¼	40	44¼	8,974
Amalgamated	110	104	108⅞	53,147
Atlantic	28½	25½	27¼	11,296
Bingham	37⅜	35¼	36	24,690
Boston Consolidated	33	31	32¼	24,607
*Calumet & Hecla	707	700	705	107
†Centennial	31¾	29	30⅛	9,495
Mercur	.62	.61	.61	1,370
*Copper Range	84⅛	81	82¼	20,618
Daly-West	18	17½	17¾	1,700
Franklin	19⅛	16¾	19	11,815
Granby	10	9⅞	9¾	1,715
Green Con. Copper	30¾	29¾	29¾	12,169
Isle Royale	29¾	25¾	27⅝	38,182
†Mass	10¼	9¾	10¼	1,950
Michigan	17⅝	16⅝	16¾	5,075
Mohawk	60¾	59	60	2,091
*North Butte	87¾	82½	85½	16,053
*Old Dominion	42	35	41	24,453
Osceola	109½	106	104¾	2,977
*Parrot	46¼	41	41¼	17,386
Quincy	110	105	110	1,030
Rhode Island	8½	6¾	7⅞	8,220
Shannon	7¼	6¾	6¾	2,940
Tamarack	121	115	117	306
Tecumseh	16½	11	14½	4,571
United Copper, com	65¼	62	64⅝	
U. S. Mining	49⅜	46¼	49	41,569
Utah	63¼	59	62⅞	56,266
Wolverine	134	132	134	15

PHILADELPHIA.

Cambria Steel	34⅞	31	34⅜	101,157
Philadelphia Co.	52½	51	51¾	5,679
Tonopah	17⅛	16⅝	17½	2,110

PITTSBURG.

Crucible Steel	14⅞	13¾	14⅞	18,498
Crucible Steel, Pref.	79½	71⅜	79	8,439
Tonopah Ext.	8.60	5.65	8.00	20,265

COLORADO SPRINGS.

Name of Company.	First	High	Low	Clg.
Elkton	47½	48	47½	48
El Paso	66½	66¾	56¼	56¼
Isabella	23	23½	23	23½
Portland	200	200	200	200
Vindicator	70	80½	7 0	80

SAN FRANCISCO.

Best & Belcher	1.20	1.26	1.10	1.15
Bullion	.21	.26	.20	.26
Caledonia	.53	.55	.53	.55
Confidence	.88	.88	.85	.85
Con. Cal. & Va.	1.20	1.25	1.15	1.15
Gould & Curry	.23	.25	.21	.22
Hale & Norcross	1.00	1.05	1.00	1.00
Mexican	1.25	1.35	1.15	1.15
Occidental Con	.92	.92	.92	.92
Ophir	5.75	6.00	5.75	5.87½
Savage	.51	.54	.51	.51

*Ex-dividend. †1st Installment Paid.
‡Assessment Paid. §2d Installment Paid.

Monthly Average Prices of Metals.

SILVER.

Month.	New York.		London.	
	1904.	1905.	1904.	1905.
January	57.005	60.690	26.423	27.930
February	57.592	61.023	26.665	28.047
March	56.741	58.046	26.164	26.794
April	54.202	56.600	24.974	26.106
May	55.430	57.832	25.578	26.554
June	55.673	58.428	25.644	26.910
July	58.095	58.915	26.760	27.163
August	57.806	60.259	26.591	27.822
September	57.120	61.695	26.349	28.528
October	57.923	62.034	26.760	28.637
November	58.453	63.849	26.952	29.493
December	60.563	64.850	27.930	29.977
Year	57.221	60.352	26.399	27.839

The New York prices are in cents per fine ounce; the London quotation is in pence per standard ounce, .925 fine.

COPPER.

	NEW YORK.				LONDON.	
	Electrolytic.		Lake.			
	1904.	1905.	1904.	1905.	1904.	1905.
Jan.	12.410	15.008	12.553	15.128	57.500	68.202
Feb.	12.063	15.011	12.245	15.136	56.500	67.908
March	12.299	15.125	12.551	15.250	57.321	68.174
April	12.923	14.920	13.120	15.045	58.247	67.017
May	12.758	14.627	13.000	14.820	57.321	64.875
June	12.269	14.673	12.399	14.813	56.398	65.881
July	12.380	14.888	12.505	15.005	57.256	66.887
Aug.	12.343	15.664	12.468	15.725	56.952	69.830
Sept.	12.495	15.965	12.620	15.978	57.645	69.667
Oct	12.993	16.279	13.118	16.332	60.012	71.406
Nov.	14.284	16.599	14.456	16.758	65.085	74.727
Dec.	14.661	18.328	14.849	18.398	66.384	78.993
Year	12.823	15.590	12.990	15.699	58.587	69,465

New York prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars. The London prices are in pounds sterling, per long ton of 2,240 lb., standard copper.

TIN IN NEW YORK.

Month.	1904.	1905.	Month.	1904.	1905.
Jan	28.845	29.325	July	26.573	31.760
Feb	28.087	29.262	August	27.012	32.866
March	28.317	29.523	Sept	27.780	32.095
April	28.132	30.525	Oct	28.596	32.481
May	27.718	30.049	Nov	29.185	33.443
June	26.325	30.329	Dec	29.286	35.835
			Av. year.	27.986	31.358

Prices are in cents per pound.

LEAD IN NEW YORK.

Month.	1904.	1905.	Month.	1904.	1905.
Jan	4.347	4.552	July	4.192	4.524
Feb	4.375	4.450	Aug	4.111	4.665
March	4.475	4.470	Sept	4.200	4.850
April	4.475	4.500	Oct	4.200	4.850
May	4.423	4.500	Nov	4.200	5.200
June	4.496	4.500	Dec	4.600	5.422
			Av., year.	4.309	4.707

Prices are in cents per pound.

SPELTER.

Month.	New York.		St. Louis.		L'nd'n
	1904.	1905.	1904.	1905.	1905.
January	4.863	6.190	4.673	6.032	25.063
February	4.916	6.139	4.717	5.989	24.594
March	5.057	6.067	4.841	5.917	23.825
April	5.219	5.817	5.038	5.667	23.813
May	5.031	5.434	4.853	5.284	23.594
June	4.760	5.190	4.596	5.040	23.875
July	4.873	5.396	4.723	5.247	23.938
August	4.866	5.706	4.716	5.556	24.675
September	5.046	5.887	4.896	5.737	26.375
October	5.181	6.087	5.033	5.934	28.225
November	5.513	6.145	5.363	5.984	28.500
December	5.872	6.522	5.720	6.374	28.719
Year	5.100	5.882	4.931	5.730	25.433

New York and St. Louis prices are in cents per pound. The London prices are in pounds sterling per long ton (2,240 lb.) good ordinary brands.